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OCULAR THERAPEUTICS

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A MANUAL FOR THE STUDENT AND THE PRACTITIONER

BY

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ST. LOUIS

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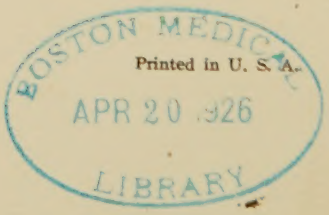

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PREFACE

This little book is an attempt to give in a few words our present knowledge of the treatment of the diseases of the eye. It is no encyclopedia, containing every remedy that has been described, but, on the other hand, I have included some which have unjustly been forgotten. I have intentionally refrained from a critical discussion of the different methods of treatment. To have done so would have meant transgressing the limits of this work, the purpose of which is to give to the beginner only a list of the remedies which may be used, and to the practitioner a quick survey of methods of treatment from which to select the one which his own experience has shown to be appropriate for the special case. The optical and operative therapy have not been touched upon, as we have sufficient works upon these subjects, and, furthermore, they should belong exclusively to the domain of the specialist. May this little book receive a friendly reception. I would be grateful for any advice as to its improvement.

ERNST FRANKE.

Kolberg, Germany.

PREFACE BY THE TRANSLATOR

The translator was led to undertake the present, pleasant task by the fact that there are available to the English speaking oculist very few books to which he can go for information as to the treatment of his patients, which, after all, is the point that concerns the latter most. They are comparatively uninterested in the diagnosis or the pathology of their ocular condition; their interest centers upon the possibility of a prompt cure. Therefore, although it is absolutely necessary for the oculist to be able to make the correct diagnosis, and to understand the underlying pathology of the patient's ocular lesion, it is equally important that he be able to furnish the relief sought. When the remedies known to him have proved inadequate, and he must turn to other sources for information, it is hoped that the present compact volume will obviate the necessity of searching through text books or more voluminous works on therapeutics. It is not an encyclopedia; it is rather an epitome, with its faults of condensation, but its virtues of exclusion.

The translator is grateful to the author and the publisher for their courtesy in permitting him to make the translation.

Clarence Loeb.

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CHAPTER I

INTRODUCTION

In the treatment of eye diseases, the physician must always remember, that very frequently he is dealing with a disease not of a single organ, but one that involves the whole body, and the treatment of the latter is often a more important factor than the local treatment, which, incidentally, is often not possible.

A correct therapy can be based only on a correct diagnosis. But that is not all. Hygiene and prophylaxis play a not unimportant role, and always must be taken into consideration.

Good air, care for the emunctories, refraining from mental and physical overexertion, and regulation of the diet play an important role.

In addition to the care of the body, the "Dietetics of the Mind" must not be forgotten. Eye patients are frequently unable to divert their minds in the manner that other patients can.

Furthermore, we know how external deleterious agents of a physicochemical or thermal nature, dust, smoke, caustic vapors and too bright illumination, can damage not only the external but also the internal parts of the eye, thus delaying the cure and causing relapses. The diseased eye cannot stand much rubbing and scrubbing. We must prevent the spread of infectious diseases by giving information as to the possibility of their conveyance by dirty hands and the use of dirty towels, basins, etc.

Some eye diseases arise from neighboring structures, the skin, the nose and the sinuses. The tonsils can cause relapsing inflammations, and the adenoids can do the same

in scrofulous children. Dental disease must be looked for (relapsing iritis). In such cases we must avail ourselves of the help of other specialists.

We must not neglect the examination of the respiratory and circulatory organs, the blood, and the nervous system, the alimentary tract, the kidneys and the liver, and the possibilities of metabolic diseases. We must pay special attention to the skin in scrofulous children. Pediculi capitis frequently keep up the ocular inflammation. Cranial congestions, such as frequently appear in women at the climacteric, as well as congestions from other causes, require a depletion treatment (foot baths, etc.). We must look for misuse of coffee, tobacco, alcohol, and too strong tea.

The state of the intestinal tract must be investigated, although autointoxication and indicanuria have not the importance for eye diseases that was previously ascribed to them. Constipation must be overcome (glaucoma); emptying the bowels is beneficial in many cases (uvea, optic nerve). Patients who must stay in bed a long time should be massaged to stimulate metabolism. Abdominal massage is often beneficial for intestinal activities.

Nutrition and *diet* are of special importance to the oculist at the present time.

The importance of *vitamines* in nutrition and metabolism, especially of young people, is well known. We can call them, in general, auxiliary nutritive substances which are necessary for formation and growth of the function of the internal glands, muscles and nerves, and whose absence causes xerophthalmus, keratomalacia of infants, hemeralopia, the hemorrhages of Barlow's disease and rickets. There are three forms, "A", "B", "C". The fat soluble "A" variety is found especially in animal fats and oils, especially milk and cod liver oil, but not in stored up fat (lard) and plant fats. It is found, also, in fresh meat and vegetables, and is absolutely necessary for the growing organism. The "B" variety, the water soluble or beriberi

form, is found in most foodstuffs, especially in the cereals and legumes, as well as in eggs. "A" and "B" together are necessary for growth, and are therefore often found together in milk, fat, meat, eggs and green vegetables. The "C" variety, the antiscorbutic, is found chiefly in fresh vegetables and fruits. All three are found in milk, butter, cod liver oil, fresh vegetables (especially tomatoes). A preparation which is rich in all vitamines is the Vitaminose-Klopfer in tablet form, especially valuable in unbalanced nutrition and anemic conditions, also rubio (fluid preparation).

In *scrofulosis*, in addition to milk, the diet should consist especially of vegetables, fruit, spinach, lettuce, green peas, green vegetables, meat and eggs in large quantities, potatoes and farinaceous foods.

Rickets requires preponderant meat diet, milk, and legumes, with internal administration of phosphorus. *Chlorosis* requires all kinds of nutrition, especially animal, much fat and milk, albumin in moderate amount, a fairly large amount of carbohydrates, but, above all, food containing iron (beef, fish, hens' eggs, spinach and lettuce).

In *kidney* diseases, the diet should be as poor as possible in salt and devoid of meat. We have been getting away from the purely milk diet lately; the amount is to be estimated for each individual case. Not too many eggs should be given, but a large amount of fats. The ingestion of large amounts of sugar and milk is to be recommended. When taken, eggs should be boiled or baked. The vegetables and the butter should be free from salt. Absolutely forbidden are stimulating substances such as radishes, horseradish, onions, celery, mustard and alcohol.

A salt-poor diet has lately been recommended for *retinal detachment*, also, with the idea of thereby eliminating much fluid from the body.

No one diet list is suitable for all cases of *diabetes*. Restricting the amount of food has a favorable influence upon diabetes, as the war taught us, if we avoid getting

into a routine. The obese should be restricted in their fatty foods, and the emaciated should be gradually fattened. In general, 1 to 1.2 grams of albumin for each kilogram of body weight should be sufficient. As to opiates, alkalines and course of mineral waters, see the respective chapters.

All authors are agreed, in spite of their different views as to the pathogenesis of *gout,* that the diet should contain as little as possible purin, i. e., it should be preponderately, but not exclusively, free from meat; and in this connection, liver, kidney, spleen, thymus and pancreas must be entirely forbidden, since they are rich in purin. Vegetables that contain considerable amounts of purin, such as spinach and tomatoes, should be avoided as much as possible. The food should consist especially of milk, eggs, bread, meal pap and meal puddings, fruit, lettuce and fruit broths, with not too much coffee, cocoa and alcohol. The meat should be very well cooked. If a diet entirely free from purin cannot be carried out, days or weeks when no purin is taken should be established. I will not go too much into details here. Every case has its peculiarities, and very often cooperation with a general practitioner will prove beneficial, if not necessary. The reader will find the answers to numerous questions that arise in the respective chapters of the general treatment.

In the examination of the eye, one must always remember that it is a very sensitive organ, whose sensitiveness may become unbearable as the result of the inflammation. The lids should not be separated bruskly and forcibly. If there is a strong spasm of the lids, it is better to instill a drop of cocaine, in order to make the eye less sensitive. However, one must inform himself as to the condition of the eye, so that it is often necessary, especially in scrofulous eye diseases, to use a Desmarre's lid retractor, after preliminary cocainization. The same aid may have to be evoked in great swelling of the lids, as in blennorrhea of the conjunctiva. In separating the lids, especially in the latter

disease, care must be taken that the secretion does not spurt into the eyes of the examiner or nurse.

This work is so arranged, that in the general part, in the first division, all of the general therapeutic measures that come into consideration are discussed in individual chapters. On account of their frequency and their importance in the etiology of eye diseases, syphilis and tuberculosis and their respective treatments have been discussed separately. These are followed by chapters on sero- and organotherapy; stimulative, light and ray treatment, electrical treatment, medical therapy; hot and cold applications; bath, bath cures, and mineral water cures.

The second division deals with local measures, mechanical, thermal, medical, and local serotherapy, which is followed by the section dealing with local light and ray treatment, and use of electricity in its various forms. In the special part, the various eye diseases and their treatments are briefly discussed. For more complete information, the reader will have to turn to the corresponding chapters of the general section.

Although a discussion of the optical and operative therapy is outside the limits of this book, short references to them will be found in the special part.

PART I

GENERAL PART

CHAPTER II

GENERAL TREATMENT

1. Tuberculosis

The views as to the manner in which the curative action of *tuberculin* is accomplished differ decidedly. In general, there are two opposing opinions. One sees in it a means of increasing an immunity that arises in the course of a tubercular disease, but which is incomplete, and also of increasing the resistance of the body to the bacilli. In this way the cells of the body are stimulated to produce antibodies, so that a permanent increase of cellular immunity may be attained and the disease permanently cured (Petruschky, Deycke-Much, Liebermeister, Ponndorf).

The other considers the direct, active immunization and the permanent, artificial increase of immunity by tuberculin preparations to be impossible, and regards its action as founded upon a focal reaction of the tissue, which arises from a supersensitiveness, and is a cellular protective reaction. Its curative action is based upon a local, focal reaction, which washes away the antigen present in the disease area and thus produces indirect immunizing processes. Through this increase, the tuberculous tissue is brought into contact with increased amounts of the protective substances present in the blood, and the cure is thus attained (Wassermann, Uhlenhuth, Hayek, Neufeld). The nature of the supersensitiveness and the manner in which the tuberculin reaction takes place have not been explained.

The doubt as to the curative action of tuberculin which prevailed among ophthalmologists was dispelled by the well-known work of A. v. Hippel, and it is now everywhere recognized, that we possess in tuberculin a valuable means of aiding the treatment of tuberculous diseases of the eye. *However, we must not expect every tuberculosis of the eye to be cured by tuberculin, or that a successful tuberculin treatment will protect against recurrences.* Also, the opinion that has been lately expressed by many, that tuberculin is in no way a specific therapy, is still a subject for discussion.

Although in the eye, it is often a question of a quickly acting therapy in order to save as much of the sight as possible, a routine employment of this therapy must be warned against.

The basis for its use in the various forms of ocular tuberculosis, among which we include scrofulosis, rests on three factors: the ocular findings, with consideration of the pathologico-anatomic type, the general findings, and the type of immunity. Upon these depend the choice of tuberculin preparation and the method of its use.

If with Ranke we consider tuberculosis to be a general disease, involving the whole body and not an individual organ, we must distinguish three characteristic stages of development: the primary tuberculid, to which belong the youthful, early forms, tuberculosis of the iris with tubercle formation; the typical secondary forms of the period of hypersensitiveness, in which the acute inflammation is the most prominent symptom (according to Schieck, periphlebitic processes in the retina, diffuse iritis and iridocyclitis, anaphylactic scrofulous forms†); and third, the late forms, especially iris tuberculosis with frequent recurrences and vitreal opacities, where a partial immunity has developed.

To these three forms correspond the different actions of tuberculin—normal sensitiveness to the toxin in the first, hypersensitiveness in the second, and relative sensitiveness in the third (appearance of partial immunity).

The different reactions of ocular tuberculosis are thus due to the state of immunity existing at the time of its use. Accordingly, we would expect the best results in the first form; less beneficial and possibly deleterious in the second, in which protein body therapy often acts better; while in the third, we may again expect better results.

A general rule is that we should begin with small doses, thus avoiding deleterious and severe reactions. Opinions differ as to what is meant by severe reactions. While some always employ small doses and avoid an increase of temperature, others consider an increase of temperature to be only an indication to recede from the last dose and later increase the doses.

So far as the different preparations are concerned, all have their advocates and their opponents. It is difficult to say which form will be the best for any particular case. We must depend upon experimentation, and if one form does not accomplish the result, we must not be discouraged, but should try another, which may achieve the desired action. In choosing the kind of preparation, attention must be specially directed to the focal reaction, which is especially easy to observe in the eye. If one variety does not succeed, another should be chosen.

A certain amount of care is necessary when ocular tuberculosis is complicated by the presence of tuberculosis in other organs. The doses must never exceed those used in phthisis. If such complications are not present, we need not be so timorous, or employ such small doses. In general, one should begin with small doses, and increase them or change the preparation only if the healing does not progress. After a cure has been obtained, the patient should be treated for half a year, if possible, ambulatory, with small doses, from which a severe reaction is not to be expected (every two or three weeks, 3/500 to 5/500 new tuberculin, or ½ to 1 mg. old tuberculin, or 1/1000 to 3/500 emulsion, or 0.5 to 0.8 Rosenbach's solution).

The oldest of the various preparations are Koch's. They

are active immunizing substances formed from the products of the tubercle bacilli. Those of Denys and Beraneck are similar. Experiments have been made with passively immunizing substances, but no reports have been made.

Koch's *old tuberculin* contains the substances of the nutrient media and of the bacilli which are soluble in water and glycerin, especially the toxin of the tubercle bacilli. We try with this to fortify the body against the toxin of tuberculosis. *New tuberculin* and *bacillary emulsions* are suspensions of whole bacilli, which are prepared by pulverizing and trituration, so that they can be taken up by the body and worked over (Deycke), i. e., a vaccine containing tuberculin in addition. By its injection, it is sought to protect the body not only against the toxin, but also against the bacillus itself. Tuberculin A. F., Koch's *albumose-free tuberculin,* obtained from tubercle bacilli cultured upon an albumose-free salt solution, has a milder action than old tuberculin. The dose is the same as old tuberculin, and one can start with tuberculin A. F., and later change to bacillary emulsion.

So far as the dosage is concerned, we begin with 0.001 mg. *old tuberculin,* increasing by one or more degrees of the syringe up to 1 mg., and increase to 5 or 10 mg., beyond which we must not go when pulmonary tuberculosis is present.

In *new tuberculin,* starting with 0.0002 c.c. of the original solution, which has been diluted with a 20 per cent glycerin solution, the dose is increased a degree daily, until at the tenth injection the whole syringeful, 0.002 c.c. is used. Then the dose is increased each time 0.002 c.c. until 0.02 is reached. From this point the increase is 0.01 up to 1.0 c.c., which dose must not be exceeded, and which can be given once or twice a week.

The initial dose of the *bacillary emulsion* is 0.0001 c.c. This dose is carefully increased to 0.001. If this dose is well borne, it can be gradually increased to 0.1 c.c. If a severe reaction appears, the treatment must be interrupted.

The *"sensitized" bacillary emulsion* (Höcht) is used in a solution of 1/1000000000. of which a degree is injected. At intervals of six to eight days, this is increased by five to ten fold, then more slowly to twice the amount. The maximum is 0.5 c.c. of the original emulsion.

All of these preparations can now be obtained from the druggist in prepared sterile solutions of the proper dilution, making the treatment much simpler for the physician. *Tuberculin Beraneck* is also furnished in proper dilution. The solutions of the latter bear the labels A-H, and the initial dose depends on the reaction of the patient to a test injection of old tuberculin. If there is a reaction to 0.0001 old tuberculin, a degree of A8 is injected, which is increased a degree every two to three days. After 10 degrees, a degree of A4 is injected, and this is similarly increased a degree at a time. In this way, we gradually pass through the other, stronger solutions, up to solution H. If the reaction does not appear until a dosage of 0.002 or 0.005 old tuberculin is reached, we can commence at once with a degree of A.

In the *partial antigen* treatment of Deycke-Much, the soluble toxin, the actual tuberculin, is removed, and the treatment is with the insoluble albuminous and fatty bodies of the bacilli. The remains of the bacilli are separated into their component parts, and various mixtures of these are injected (A, F, and N), or the treatment is with the unaltered albuminous-fatty mixture (M, Tb, R.).

In practice, the latter is the simpler method, but before commencing it, a test should be made with A, F and N by injecting 0.1 c.c. of the solution into the most superficial layers of the skin. This produces white wheals the size of lentils. For this purpose, solutions of A Nos. 8-5; F, Nos. 5-2; N, 4-1, are used, beginning with the weakest solution and using a different syringe for each partigen, i, e., 11 syringes and needles for the three test injections. Everything necessary, with full directions, is furnished by Kalle & Co., Biebrich. As a control, an injection is made of

sodium chlorid solution containing carbol, which should not give a reaction. All 13 injections must be made at the same sitting, and the result will be observed on the fourth day. However, the patient should be watched for a longer time, in order to obtain an idea of his power of defense or its lack. Whatever the result of the test injection, we begin with suspension No. 9, 0.1 c.c., giving daily injections (in the hospital, or ambulatory if the case is a mild one). The dose is increased twice a week, No. 9, from 0.1 to 0.2 and 0.4 c.c.; No. 8, 0.15, 0.3, 0.6, c.c.; No. 7, 0.1, 0.2, 0.4 c.c. No advantage of the antigen treatment over the usual subcutaneous method has been proved. In eczematous diseases, some authors state that it is less beneficial.

Rosenbach's tuberculin is made by causing an overgrowth of the tubercle bacillus with trichophyton, and is less toxic than the other tuberculins. A test injection of 0.01 c.c. should be used to ascertain the sensitiveness. According to this, we start at 0.01 to 0.2 c.c. and increase 0.1 c.c. or less every two or three days, or less often. The increase should not be too rapid, and a dose of 1.0 c.c. can be reached without untoward symptoms. If a severe reaction appears at from 0.4 to 0.7 c.c., the treatment must be temporarily discontinued, and again started at the same or smaller dose. When the dose of 1.0 c.c. is reached, there should be an intermission, and the series then repeated. Many give the medium doses, about 0.5 c.c., at intervals of three to eight days, for a long time.

Friedman's remedy is a suspension of living acid-fast bacilli from a tuberculous tortoise, which do not cause pathologic symptoms in man and warm-blooded animals. Injections are made in the gluteal muscles. Results so far permit no definite conclusions as to its value.

Subcutaneous injections are as a rule made in the arm, back or breast, and it is the most serviceable method in the treatment of tuberculosis. In addition to this, we have the *intracutaneous* and the *percutaneous* methods. Wolff-Eisner has worked out a special technic for the former. He

injects his mixed tuberculin, i. e., a mixture of old and new tuberculin, in two or three places in the arm, using for each one-third c.c. of a solution of 1/1000 to 1/100, so that blebs are produced. While the local reaction appears, the dose may not be increased. Usually, it does not exceed 1/10 mg., thus avoiding fever.

The *technic of Ponndorf* has obtained a more general employment than that of Wolff-Eisner. It consists in making in the skin of the upper arm 20 to 25 superficial incisions, lying near each other, which penetrate only the epidermis. The best instrument to use is a vaccination lancet. A wound of about the size of a silver dollar is thus produced, into which a drop of old tuberculin is rubbed. In twenty-four to forty-eight hours there appears at the site of the incisions a more or less severe inflammation, which usually gets well in five to ten days, but often lasts longer. A slight pigmentation at the site of the test gradually disappears. Slight rises of temperature that soon vanish are not unusual.

Four weeks after the first treatment, Ponndorf makes the second, and after another four weeks, the third, continuing the treatment for a long time after recovery. In acute inflammations in scrofulous children, we have usually repeated the treatment after fourteen days, and occasionally even after eight days, the number of treatments depending on the severity of the case—three, seven, or eight. We have never seen untoward results following them. In scrofulous children, the striking euphoria is often apparent after a few days.

Ponndorf has lately produced two preparations; one especially for scrofulous or tuberculous patients, and the other for mixed forms. These may be obtained in sterile ampoules from the Sachsische Serumwerke, Dresden.

Petruschky's percutaneous method uses his linimentum tuberculini comp., which is supplied in various strengths, 1/5; 1/25; 1/150; and for especially susceptible patients, 1/5000 and 1/25000. One usually begins with the 1/150

strength. This is rubbed in every four days, the first two times 1 drop, then 2, then 3, 4, and 5 drops. Then 1 25 is used, and finally 1 5. This is used every seven days, beginning with 1 drop twice, then twice 2, 3, 4, and 5 drops, after which there is an intermission of two to four weeks. For very insensitive and well-nourished patients, there is a linimentum tuber. concentrat., which may be used in the same way as the above. If extreme lassitude appears, the weaker doses are repeated and the patient put to bed. The rubbing should always be done with a glass rod, and the treatment continued several months. Bernheimer has recommended it in scrofulous children, especially for after-treatment.

Finally, *ectebin*, a salve made from concentrated tuberculin and dead human and bovine tubercle bacilli, has been used by many for percutaneous medication. The breast and the back should be rubbed with it at intervals of one to four weeks. In this way, it is said that a positive anergy is attained, and recurrences are prevented. However, it is claimed that it is not entirely without danger.

In all tuberculin injection cures, it is important to take the temperature of the patient once or twice daily previously; and during the cure, the variations should be controlled by taking the temperature three times a day. Such a cure, therefore, should usually be carried out only in a well conducted institution, although the injections after the cure is completed may be made ambulatoric. The same is true of the partial antigen treatment of Deycke-Much, while the treatments of Ponndorf, Petruschky, and that with ectebin may be carried out ambulatoric.

Some of the tuberculin cures, especially those of Petruschky and Ponndorf, can be combined with intracutaneous or intramuscular protein body therapy (see p. 54). This latter, when used alone, has sometimes produced brilliant success in cases of tuberculous and especially scrofulous disease of the anterior part of the eye.

Spengler's immune bodies have been recommended by

several authors for percutaneous treatment. This is made from the whole blood, especially the red blood cells, and is said to cause a passive immunization. Solutions of 1/50000-1/20000 are used for months. Some authors (Bock) have obtained good results, while others have not. This method does not seem to have been used very much in ophthalmology.

There are no reports in ophthalmologic literature dealing with *tebelon*, a fatty acid butyl ester. Of this, 1 c.c. of a 1 per cent solution is injected subcutaneously or intramuscularly, in order to cause the formation of antibodies to prevent the growth of the tubercle bacilli.

Summarizing, we may well agree with Romberg, who says that in many patients tuberculin is "the indispensable specific means of promoting the natural processes of healing in tuberculosis". Even though some methods, such as those of Petruschky and Ponndorf, do not permit an exact dosage, in appropriate cases they produce good results. Since we have no immediately effective vaccine, we must not enter upon the treatment with excessive expectations. It is even possible for the treatment to be harmful, if the body from weakness or some other cause is not able to produce the curative substances.

In addition to this specific treatment, there is the *chemotherapeutic* one with chrysolgan, introduced by Schnaudigel. Chrysolgan, aurocantharidin, containing 50 per cent gold, is a bright yellow powder, which prevents the growth of tubercle bacilli in a dilution of 1/1,000,000, and in addition calls forth the protective substances of the organism and excites the activity of the antibodies. The powder is readily soluble in double distilled water. It should be given once or twice a week intravenously, 0.05 in children, and 0.1-0.3 in adults. In general, 0.3 is the largest dose, occasionally raised to 0.4. On the average, seven to eight injections should be made, the largest number should be 12 and the largest total dose 2.4 grams. Following the injections, a slight, transient rise of temperature is occa-

sionally noticed, also malaise on the same and following days. Eruptions on the skin, stomatitis and albuminuria may follow.

This treatment can be combined with small doses of mercury on the day of the injection, and small doses of tuberculin can be given twenty-four hours later. It can likewise be combined with sun baths, raying of the whole body or local radium treatment. It is especially useful in recent choroiditis and iridocyclitis, but acts favorably, also, in chronic uveitis, serous iritis, tuberculous keratitis and intractable episcleritis.

Of course, the treatment of tuberculosis and scrofulosis is not exhausted with tuberculin and chrysolgan. Air, light, sun, high altitudes, good and rich nourishment and parenteral albumin therapy should be employed for the general treatment. While many patients do well on residing in a high sanitarium, scrofulous children are helped better by a cure in a sun bath or at the sea. Also, general and local raying, light treatment and sun at high altitudes are advantageous in many cases.

Furthermore, the medicinal therapy should not be neglected. Cod liver oil in its various forms, and calcium, recommended by Wessely, are useful, as well as silicium, which Stock has recently found to be useful as a supplemental treatment, on the grounds that it aids the scar formation in the tuberculous foci. This will be discussed further at the proper place.

2. Syphilis

In the treatment of syphilis of the eye, three substances come into consideration: mercury, salvarsan and iodine.

Mercury is used endermically, hypodermically or intramuscularly, or by mouth. The recent method of intravenous injections in combination with salvarsan will be discussed later. Baths, in the form of sublimate baths, are to be used only in congenital syphilis.

In the *endermal* method, we have the old inunction with grey ointment. Instead of the officinal ung. hydrarg. cin., the ung. hydrarg. c. resorb. parat. has been recommended, and the sapo cin. (Unna) has been advised by some. Women from whom the use of mercuric ointment must be concealed may be "massaged" with ointment colored with vermilion.

The treatment is carried out as follows: on successive days, in the following order, the right upper arm, left upper arm, right thigh, left thigh, right leg, left leg, are rubbed with the salve. On the seventh day, in a warm bath, the salve is washed off with soap, and no inunction is made on this day. On the eighth day, a new rotation of treatment is commenced. If one wishes, the abdomen and the back, or better still, the sides of the thorax, can be rubbed instead of the thigh and legs. In some institutions, the bath is on the sixth day, following five rubbings, and in delicate individuals, the bath may follow four rubbings.

So far as possible, the hairy parts should be avoided, and therefore, the flexor rather than the extensor surfaces should be rubbed, or the sides of the thorax, as mentioned. It is best to make the rubbings in the evening, and to protect the bedclothes, a stockinet shirt with long sleeves should be worn; long drawers when the legs are rubbed. For each treatment, 3, 4 or 5 g. of ointment are rubbed into the skin for about fifteen minutes with equal and not too strong movements. After the treatment, the skin should be a dull grey or a bluish-black color. Gold rings should be removed beforehand! If the rubbings are done by attendants, they should wear leather gloves, which is to be preferred to a pad covered with rubber tissue or a pestle like instrument. The duration of the cure is five to six weeks; a shorter time is not good, and a longer is sometimes necessary.

Welander permits the ointment to be used only upon the breast, and covers the treated area with a linen cloth.

During the cure, attention must be paid to the teeth and

mouth. Ten to twelve times daily, the mouth should be washed out with water containing some tincture of ratanhia or myrrh, solutions of borax (2 per cent to 3 per cent) or alum, hydrogen peroxide, 2 teaspoonfuls to a glass of water, or liq. alumin. acet., ½ teaspoonful to a glass of water. Of value, also, are the tooth pastes, pebeco and kalichlora, and formamint tablets. The teeth should be cleaned after each meal with a soft brush. Smoking should be restricted as much as possible. It is important that the food should be good and nourishing.

If a mercurial stomatitis appears, the cure must be interrupted and the salve removed by a warm bath. The lavage of the mouth must be continued, and any ulcers of the mucous membrane should be painted once or twice a day with a 2 per cent to 3 per cent chromic acid solution, or hydrogen peroxide. The 10 per cent silver nitrate solution is less to be recommended, as its long continued use causes a black discoloration of the teeth. In case the salivation is severe, pills containing 0.5 mg. of atropine may be given once or twice a day. A mercurial eczema can be best avoided, as noted above, if the rubbings are on the less hairy parts of the body. A mercurial erythema is a contraindication for the rubbings. It gets well, although slowly, under dusting powder.

To prevent disturbances in the alimentary canal, which is especially likely to happen when the mercury is taken internally, the diet should be a light one. Fatty, indigestible, heavy, bloating foods should be avoided, or the cure discontinued. For particulars, see *"internal administration"*. On account of kidney troubles, which sometimes occur, the urine must be frequently examined during the endermal treatment.

There are a large number of preparations used in the *subcutaneous* and *intramuscular* administration of mercury. Levin was the first to use the 1 per cent aqueous *sublimate solution*, whose solubility was increased by the addition of sodium chloride (sublimat. 0.3, NaCl 1.0, Aquae

dest. 30). Every day, 1.0 gm. = 0.01 sublimate is injected, or every second day 2.0 gm. = 0.02 sublimate. Then, we have *pepton-mercury,* serum albumin mercury in 1 to 2 per cent solution, of which 1.0 gm. is to be injected every second day intramuscularly. Among the aqueous solutions are *hydrarg. oxycyanide,* 0.25 to 100.0, and *Hirsch's solution,* which contains acoin to allay the pain. The dose is a syringeful daily. The number of injections should be about thirty; more than forty are not advised.

Another preparation is *asurol,* 5 per cent solution, 2 c.c. every second day. It is said not to be painful.

Novasurol, 1 to 2 c.c. of a 10 per cent solution, may be injected three times a week in the gluteal region. It is especially useful in weak children and those with delicate internal organs. During a cure of six weeks, comprising twenty injections, over 1.3 gm. of mercury are given. The ampoules contain 2.2 c.c. We begin with 1.0 c.c., in order to test the tolerance, and then increase.

Embarin (sodium mercurisalicylsulphonic acid), containing 3 per cent mercury, with the addition of ½ per cent acoin, is likewise injected intragluteally. We begin with 0.4 gm., increasing to 0.8 and 1.2 c.c., making an injection every two to three days until ten to twelve have been given. It comes in ampoules containing 1 c.c. The injections are said to be painless, and act well in nonluetic affections also. As to the combination with salvarsan, see later.

Hydrarg. formamid., aqueous 1 per cent solution, in doses of 1 c.c., may be injected every day or every second day, until thirty to forty have been given.

Enesol is a soluble salt of arsenic and mercury, furnished in ampoules of 2 c.c., each containing 0.06 mercury. Two c.c. are injected every second day subcutaneously or intramuscularly. After ten to twelve injections, an intermission of eight to ten days is followed by ten injections, twenty-two in all. It may also be used intravenously. Twenty ampoules are sufficient for a cure. It is said to be without danger or discomfort.

Of the insoluble preparations, the one most used is *calomel,* suspended in olive oil, dose 0.1, six to eight injections at intervals of eight days for one course of treatment. These injections are very painful, and in spite of every care, it is not always possible to avoid a subsequent abscess. *Hg. salicyl.* is used in a 1 to 9 oil emulsion, 0.1 at a dose, eight to twelve injections at intervals of one week.

Mercinol, ol. ciner., has a permanent action, but is dangerous on account of the slow and bad absorption. One must stop after the second injection if an infiltrate forms at the site of the injection.

The soluble salts are injected subcutaneously, between or under the shoulder blades, while the insoluble are injected intramuscularly, in the upper outer quadrant of the buttock. The needle is inserted two to three cm., care being taken to avoid blood vessels. The site of the injection is covered by adhesive plaster.

The syringe should be cleaned and disinfected with carbolic acid or alcohol, and the lumen of the needle should be dried by blowing through it with a rubber syringe.

The action of the injection lasts longer with calomel and the insoluble salts, and less with the aqueous solutions. If an infiltrate appears, it should be treated with rest, compresses or hip baths.

The *intravenous* administration of mercury, which has been tried lately, seems not to have any specially potent antiluetic action, and is not adapted to the development of a deposit action.

As the result of an unexpected absorption of a deposit of mercury, which has been altered by inflammatory reaction, the insoluble salts may cause a sudden mercury poisoning. The old mercury rubs are still the best for attaining a constant and energetic absorption, although here, too, toxic symptoms cannot always be avoided. If external conditions make the rubs inadvisable, recourse must be had to injections.

For the *internal* administration of mercury, we may use

the *sublimate* in the form of pills, 4 to 5 mg. per dose, three to four times a day. *Calomel* may be used in children, 0.01 to 0.2 gm., three times a day, but this is of no aid in adults. Instead of sublimate, *Hg. biniod flav.* may be used, also in the form of pills, 0.01 to 0.015 per dose, and 0.1 to 0.15 per day. *Hg. oxid. tannic.* is well borne in large doses: 2.5 with sugar and powdered licorice āā q.s. to make 50 pills, one to two pills t. i. d. Among the newer remedies are *mergal* (Hg. tannic.), 0.05 to 0.1 in a capsule, three to six capsules daily, and *meriodin* (mercury diiodparaphenolsulf.) in tablets containing 0.0021 of iodine and 0.0033 mercury, five to six to be taken daily. One hundred fifty to two hundred may be used to supplement a mild salve treatment. The tablets are well borne. *Hg.-glidine,* a preparation of mercury and plant albumin, comes in tablets containing 0.005 gm. mercury, three to six to be taken daily after meals.

As mentioned above, the internal administration of mercury may be accompanied by mild disturbances of the stomach and intestines. Therefore, a light diet is in order, and indigestible food, acid and very fat foods and fresh fruits must be avoided. If symptoms appear, the treatment must be at once discontinued, and opium used if necessary. Beer is to be used cautiously. The treatment requires a longer time than the rubbings.

In *congenital syphilis,* the internal administration of mercury is the best method. We use in children of a few weeks of age, three times a day, 6 to 8 mg. calomel; three months old, 1 cg.; older children, 1.5-2.0 cg. (calomel 0.006-0.01-0.02, sugar 0.3, three times daily). Bowel movements greenish to greenish-grey.

For external use, also, there is Unna's mercury plaster, with which a part of the body is covered, as well as sublimate baths (1 to 2 gm. in a wooden tub) daily or every second day, and sublimate injections, 1 to 2 mg. per dose every eight days, five to six altogether.

Salvarsan. Of the salvarsan preparations, the ones most

used are *old salvarsan, neosalvarsan,* and *silver-salvarsan.* The original intramuscular injection has been generally abandoned, or is used only in children or in patients whose veins are so delicate that intravenous injection is impossible. Intravenous injection is the method universally employed now, either with the Weintraud apparatus, or, better, with a 10 c.c. syringe directly into the vein of the elbow, which is easily revealed by compression of the upper arm. The needle is carefully pushed through the skin and then inserted into the vein. The appearance of blood shows that the needle is in the vein. If the vein has not been pierced, a swelling appears at its side.

For intramuscular injection, salvarsan dissolved in oil or liquid paraffin is used, or neosalvarsan dissolved in warm water with a small amount of salt solution (0.3 to 0.45 neosalvarsan to 2 c.c. for adults; less for children: 0.3 neosalvarsan equals 0.2 salvarsan).

The syncope caused by the injection is to be treated by injections of camphor. In some people, the injection is followed by an urticaria exanthema—this is less frequently observed with silver-salvarsan. This will disappear of itself, as well as the bitter taste in the mouth. In order to prevent or limit the dermatitis, it is advised to inject five to ten c.c. of a 10 per cent afenil solution intravenously, if possible twenty-four hours before the next salvarsan injection. This has also been injected at the same time as the salvarsan, and has also been used as a solvent for the latter. It is said to have a very beneficial effect upon the subjective symptoms (headache, vomiting, and nausea). Organic heart disease and arteriosclerosis are contraindications. Sometimes the congestion of the head does not appear if 0.5 to 1.0 c.c. of suprarenin (1:1000) is injected intragluteally ½ to 1 minute beforehand. If such a symptom appears, it is advised to give 0.5 to 1.0 mg. suprarenin immediately before every subsequent injection. If there is a rise of temperature, 0.3 of pyramidon is given.

Other lesions caused by injection of salvarsan are

hemorrhagic encephalitis, gastrointestinal disease, atrophy of the liver and kidney disease. Necrosis of the cornea (Hegener) and optic neuritis have also been reported.

These lesions, as well as the occasional death, has caused the Imperial government, through a commission, to issue exact regulations for the use of salvarsan, of which the following are the most important:

1. The earlier salvarsan is used in all forms of syphilis, the more favorable is its action.

2. It must be preceded by examination of the heart and of the urine.

3. If there is any disturbance of the health, salvarsan is to be used with care; in severe disturbances, it must be entirely abandoned. It should not be used when the patient is fasting or has an overfilled stomach.

4. Especial care is necessary in the case of undernourished, cachectic or anemic patients, as well as in status thymolymphaticus, diabetes, struma, Basedow's and Addison's diseases, tuberculosis of the lungs, disease of the heart, blood vessels, liver and digestive organs, obesity, alcoholism, epilepsy, disease of the kidneys or suspicion of it, and pregnancy. In syphilitics with symptoms pointing to the central nervous system, or who showed disturbances upon previous injections, only small doses should be tried.

5. For the first injections, only small doses should be used (salvarsan, 0.1 to 0.2; neosalvarsan or sodium salvarsan, 0.15 to 0.3; silver-salvarsan, 0.1 to 0.2). In strong, young men, the largest amounts to be used are 0.3 salvarsan, 0.45 neosalvarsan or sodium salvarsan, 0.25 silver-salvarsan.

Later, larger doses may be given (0.3 to 0.4 salvarsan; 0.45 to 0.6 neosalvarsan or sodium salvarsan; 0.25-0.3 silver-salvarsan). These doses should not be exceeded even in robust men, and in women the dose should not be

over 0.3, 0.45, and 0.25, respectively. In children, the dose is regulated by the appearance and the body weight. In infants, the dose is 0.005 to 0.0075 salvarsan, 0.0075 to 0.015 neosalvarsan, and 0.003 to 0.001 silver-salvarsan per kilogram of body weight.

6. When the larger doses are being used, there should be an interval of three to seven days. During the smaller doses, the interval may be shorter.

7. The total amount of salvarsan given within six weeks should not be more than 2.5 to 3.0 salvarsan, 4.0 to 5.0 neosalvarsan, or 2.0 to 2.5 silver-salvarsan. These amounts may be exceeded only in very robust patients. If mercury is used at the same time, the dosing must be carefully watched as well as the condition of the patient.

8. During the cure, the patient should avoid all strain and excesses, and should rest fifteen minutes after the injection.

9-10. The patient, himself, should report all disturbances to the physician. A rise of temperature after the first injection is no contraindication for subsequent ones, but repeated rise is a danger signal.

11. If an exanthema appears, the treatment is to be discontinued for fourteen days. If there is a generalized inflammation of the skin, it must be abandoned.

The next paragraphs contain regulations as to the preparation of the solutions, which should be done just before the injection. The asepsis should be perfect, and the dissolving should not be done in the syringe. Sterile, freshly distilled, slightly warm water should be used, and only clear solutions should be employed.

14. The contents of damaged ampoules, solutions remaining over from previous injections and preparations that are off-color should not be used. The solutions should

be used at once, and large amounts for successive patients should not be made at one time.

15. The needle of the syringe should not be moistened with the salvarsan solution, and after its insertion should lie well in the vein. The injection should be made slowly and at once discontinued upon the appearance of pain, or the formation of an infiltration, or the slightest sign of dyspnea.

In regard to the differences between the various preparations, it should be said that neosalvarsan is the preparation for the average doctor, on account of its being well borne, and of its simplicity of use (dissolving in 1 to 3 c.c. double distilled sterile water). The old salvarsan is apparently only occasionally used. Silver-salvarsan is three times as potent as the old salvarsan, and is said to cause no permanent bad results. In hypersensitiveness, 0.5 to 1.0 c.c. suprarenin should be injected subcutaneously, and the doctor should not leave the patient for at least five minutes.

Salvarsan has been given in tabes *intradurally* also, in small doses (Nonne). Gennrich claims to have had wonderful results with it in optic atrophy. There are opposing views as to the value of salvarsan in this disease. Although an antiluetic treatment is not indicated in certain types of tabetic atrophy, there are numerous cases in which this is not true. Especially in beginning atrophy, silver-salvarsan in careful and appropriate single doses has been recommended by many. One should begin with small doses and long intervals, and increase the dose and shorten the interval only if the treatment is well borne.

There is also a method of intradural use of salvarsan in the form of salvarsanized blood serum, that is, serum made from blood which is removed shortly after an intravenous injection of salvarsan has been made. However, no better results have been obtained from this, and the method is not adapted to the average physician.

Reference must also be made to the question of nerve

involvement. Sometimes after the treatment with salvarsan, an inflammation of the optic nerve has been observed which was thought to be a lesion due to the treatment. However, it has been found that this disease has been cured as the result of the continued use of salvarsan, and it is believed that the process is a provoked neurolues. The physician must be prepared for the appearance of this condition, in order to be able to calm the patient.

The treatment with salvarsan alone, or with a subsequent mercurial treatment, is used usually only in the presence of the primary lesion, which the oculist seldom has the chance to see on the conjunctiva or the lids. Usually, therefore, we use salvarsan in connection with a mercury cure, only in the following way—a course of four to six rubbings with grey salve is followed by an injection of salvarsan, and this sequence is repeated. If instead of the rubbings mercury salts are used subcutaneously or intramuscularly, an injection of salvarsan follows a number of these.

For example, a course of intramuscular injections of calomel in combination with salvarsan is carried out in the following way (Axenfeld): We begin with an intramuscular injection of 0.02 calomel. This is followed in four days by 0.04, and this in four days by 0.05. Then neosalvarsan, 0.15 in 1 c.c. 0.6 per cent NaCl solution is injected, which is followed by the same dose three to four days later. Four days later, 0.3 is given, then five days later 0.45 in 2 c.c. NaCl, and seven days later 0.6 in 4 to 5 c.c. of the solution. Between the two latter, an injection of 0.05 of calomel is given to augment the action. After 2.0 gm. of salvarsan have been given in all, calomel is again used, until a total amount of 0.5 gm. of calomel have been given. At the end of the treatment, one more injection of salvarsan is given.

It is better, however, not to adopt a rigid technic, but to treat each case according to the constitution of the patient and the reaction of his body to the remedy.

As to the results of the so-called *mixed injections* of

Linser, the reports greatly vary. The method consists in the intravenous injection of salvarsan and sublimate or novasurol, or of neosalvarsan and embarin or cyarsal (Riedel). The syringe contains 0.3 neosalvarsan with 1 to 2 c.c. of the mercury solution, which is injected about every five days—altogether, 3 to 4 gm. neosalvarsan and 16 to 20 c.c. of the mercury solution in twelve to fourteen injections. The mercury solution may be bought in ampoules containing 1.1 c.c. of the 4 per cent, or 2.2 c.c. of the 1 per cent solution. It was thought that this method would give the greatest action against the spirochetes, but according to the opinion of authorities, the action is not so energetic or so permanent as the intravenous injection of salvarsan alone, combined with the intramuscular injection of soluble mercurial salts. Furthermore, some unpleasant symptoms have been observed, so that it is certainly not suitable for ambulatoric use, and the treatment should be employed only on hospital material. It is necessary to await further reports.

A very recent silver-salvarsan preparation, *neosilver-salvarsan,* is said to be well adapted for intramuscular injections. Two injections are made before and two after the mercury cure, intragluteally. It is said not to cause pain or abscesses. Intravenously, it is given twice weekly, at first 0.2, then 0.4, altogether 2.8 to 4.6 in eight, ten or twelve injections.

Whether the oculist should always combine a salvarsan with a mercury cure will depend on his personal experiences. For example, the views vary as to whether this combination has an influence on parenchymatous keratitis. Yet we can agree with Hirschberg that the old classic rubbings are the best method of treating ocular syphilis, and the number of recurrences are perhaps lessened by salvarsan. He recommends mercury in gummatous inflammations of the optic nerve, and has obtained with it permanent healing without recurrence. Of course one should not be satisfied with one course of treatment, but

should follow it in two to six weeks with another, and in four to five years the cure must be repeated sometimes, accompanied by treatment with salvarsan.

Potassium Iodide. The third specific remedy against syphilis, iodine, is almost always given internally, either in an aqueous solution of sodium or potassium iodide 1 to 3 to 5 gm., three times daily, sometimes 8 to 10 gm., the larger doses often being borne better than the smaller. Instead of the solution, the powder in gelatin capsules has been highly recommended, as they dissolve in the intestines and do not upset the stomach. They contain 0.3 to 0.5, and 1 to 2 are given three times daily.

Iodine should always be taken *after* meals, and if it is not well borne should be taken in milk or, better, in chalybeate water. Sodium iodide is often better borne than potassium iodide, but has not so powerful an action. Instead of the inorganic salts, the organic iodine preparations are in great favor, the oldest of which is *sajodin.* Then we have *iodtropon, iodglidine, iodocitin, diiodyl, iodostarin, iodfortan* and others, all in tablet form and often better borne by the sensitive patient than the salts. The amount of iodine in the tablets is less than the usual dose of a tablespoonful of the salt, but is said to have just as good an effect on account of the organic combination. The dose is 1 to 2 tablets of 0.25 to 0.5 gm. three times daily.

Finally, *iodipin,* an organic combination of iodine with the unsaturated fatty acid of the oil of sesame, containing 10 to 25 per cent iodine, is given in the 10 per cent strength internally, or the 25 per cent subcutaneously, in doses of 5 to 10 gm. daily or every two or three days. For internal use there are also iodipin tablets, each containing 0.2 (=0.005 iodine) one tablet to be given three times a day. They do not give off free iodine in the stomach or intestines.

A very pleasant and at the same time active form of iodine administration, especially for patients for whom the stomach method of use is unpleasant, is the rubbings with

iothion, a combination of iodine and sulphur, which penetrates the skin and is quickly taken up by the body. The oily solution or the salve (0.1 to 0.2) is rubbed in daily for several minutes. In order to prevent irritation of the skin, the sites of the rubbings are changed. It may be stated that recently iodine has been given intravenously, but no better results have been obtained thereby.

It often happens that the administration of iodine is accompanied by unpleasant symptoms, such as iodine acne and iodine colds, an unpleasant taste in the mouth, and occasionally a swelling of the thyroid. Especially sensitive patients show more severe symptoms of iodism; headache, trigeminus neuralgia, and frontal sinus catarrh. The best remedy is 0.5 antipyrin two or three times daily.

It must be emphasized, that when iodine is given internally, calomel must not be dusted into the eye (formation of cauterizing salts of mercury and iodine).

The chapter on the treatment of syphilis cannot be closed without mentioning *Zittmann's decoction,* of which there is a stronger and a weaker form. It consists of a decoction of the sarsaparilla root with other, unessential constituents. The stronger form contains an addition of senna leaves and probably also mercury, since during the boiling a bag containing cinnabar and calomel is hung in the solution. Of the strong solution 250 to 500 gm. is drunk hot in the morning, and the patient is wrapped in woolen blankets and allowed to sweat for one to two hours. In the afternoon, he drinks the same amount of the weak solution cold. The remedy has a strong purgative action, and should therefore be used only by patients with healthy intestinal tracts, and is suitable only for the very late and tertiary forms of syphilis.

Recently, several new additions to the old methods of treatment have been advocated, which will now be mentioned.

v. Notthaft has recommended *colloid silver* solution for the treatment of luetic processes of all kinds and stages,

and claims to have seen wonderful results. Two to four c.c. of a 2 per cent solution is slowly injected intravenously, and every subsequent injection is increased 1 c.c. until 10 c.c. are being given. The solutions are to be used if other remedies cannot be used (mercury or salvarsan idiosyncrasy), or for the purpose of increasing their action. Also, they can be used between two cures, in order to assist the treatment longer and with relatively harmless remedies. The treatment with collargol should not extend over three weeks.

Recently, the supplementing of mercury with *bismuth* has received much attention. The presence of bismuth in the cerebrospinal fluid has been demonstrated, and four weeks after the termination of a bismuth cure the Wassermann is negative. Of unpleasant complications, irritation of the kidneys has been noticed, so that the urine must be watched. Other symptoms are diarrhea and nausea, also stomatitis, which is not so frequent or so severe as mercurial stomatitis, and finally the well known line on the gums. The best known German preparations are *bismogenol,* the suspension of a bismuth combination in olive oil, of which 0.5 c.c. is first injected intragluteally, at intervals of three days, increasing to 1 to 2 c.c. in three-day intervals. Altogether, twelve to fifteen injections are given.

Bisan (Bayer) comes in a 20 to 25 per cent oil emulsion and in a 10 to 15 per cent aqueous solution. Both are injected intramuscularly at intervals of two to four days, ten to twelve injections of 1 to 2 c.c. After five to six days, the treatment can be discontinued for ten to fourteen days, to be followed by five to six injections. The oily solution is more potent than the aqueous. A colloidal preparation, *bismuth diasporal,* in ampoules of 1 c.c., is injected intravenously, also an organic preparation made by the Stroschein company.

The results in ocular disease are said to be good, some claiming that they are better than with mercury. Their action is especially beneficial in nerve involvements. At

any rate, they may be used when mercury and salvarsan are contraindicated.

Another remedy is *antiluetin,* a preparation of antimony, which has lately been improved by the addition of mercury, and is known as *neoantiluetin,* an antimony mercury compound, which is given subcutaneously with the addition of novocaine in order to lessen the pain (neoantiluetin 0.975, novocaine 0.3, physiologic salt solution 30.0). The same amount is given intravenously, but without the addition of novocaine.

A judgment upon the results of this new remedy is not yet possible.

3. Serotherapy and Organotherapy

The purpose of serotherapy is to add to the body substances which either excite the cells of the body to an increased formation of antibodies against the noxious substance that has entered it, active immunization, or which contain substances which destroy the noxious substance in the body without the aid of the former, passive immunization. The active immunization is practically the only form with which the treatment of the eyes is concerned. The tuberculin treatment ranks as such, concerning which the reader is referred to the special section.

In addition to this, serotherapy deals principally with septic and infectious processes.

The first of these is *diphtheria* of the conjunctiva in its various forms, from the mildest croupous deposit to the severe infiltration of the conjunctiva. The prognosis of the grave forms has undoubtedly been improved by the timely injection of the serum. Corneal affections, which for the most part are caused by mixed infections, are no contradiction. Paralyses after diphtheria are hardly influenced by it, in spite of the belief to the contrary. The serum is furnished in bottles containing 200-10,000 units. The injections should be made as early as possible, even in

only suspicious cases with membrane formation, and should not be delayed until the result of the bacteriologic investigation is known. The recent views as to the number of units to be given vary widely, but at least not less than 1000 to 2000 should be given. Many authors advise to start with 1550 to 3000. The injections are made into the back or the abdominal wall, subcutaneously or intramuscularly.

For the use of diphtheria serum in other infectious diseases, the reader is referred to the section on protein body therapy.

A *pneumococcus serum* for active and passive immunization has been made, also a combination of both has been attempted (Römer). It has been used in ulcus serpens, and also has been recommended for prophylactic use. In order to increase the action against the different strains of pneumococci, the Höchst Co. has produced a polyvalent serum, 100-250 c.c. of which is given intravenously or subcutaneously. The intravenous injection has been followed by chills, temperature up to 39° C., albuminuria and collapse. Solm gives larger doses by mouth, and claims to have had good results. Neither of these methods has secured adoption. A questionnaire by Axenfeld showed that it was not reliable even in the early stage. Römer later gave up the active immunization with killed cultures. The prophylactic injection is recommended even in mixed corneal ulcers (10 to 20 c.c.), also in operations with increased danger of infection, and in cases of suspected infection with pneumococci after traumatism.

Streptococcus serum is used in severe streptococcus infection of the conjunctiva with danger of involvement of the cornea, as well as in erysipelatous or phlegmonous disease of the lids or lacrimal sac. The best sera are those of Meyer-Ruppel (Höchst), Aronson (Schering), and that of the Behring company (Uhlenhuth), of which 25 to 100 c.c., according to the severity of the case and the age of the patient, corresponding to 500 to 2000 I.-E., is injected between the shoulder blades or into the lateral abdominal

walls. This should be repeated in a few days if the symptoms do not disappear. The French recommend Doyen's antistreptococcus serum for purulent dacryocystitis. Of this, 2½ to 5 c.c. are given, at first daily, then every other day, until ten injections have been given.

By means of killed bacteria, *staphylococcic* serum is said to cause active immunization. The best results have been obtained by the use of sera obtained from vaccines of the patient himself, which, however, can be used only in processes which do not demand immediate attention. In urgent cases, one may use the polyvalent sera furnished by the trade, the *opsonogen* (Chemische Fabrik Güstrow), and the *staphar* (Sächsiche Serumwerke). The former comes in ampoules containing 1 c.c., 100 to 500 million killed germs. On the first day, 100 to 200 million are injected, on the third day 300 million, etc. Staphar is injected in doses of 1 to 2 c.c. Both are given subcutaneously.

The *autovaccines* are made from a culture on agar, which is washed off with a sterile physiologic salt solution after one or two days. The emulsion is well mixed in a sterile reagent flask and sterilized at 60° C. This is diluted to the desired bacterial content by the salt solution to which has been added ¼ per cent lysol. In children, we begin with a dose of 20 million, repeating and increasing the dose according to state of the disease every eight or ten days.

The treatment is indicated in chronic diseases of the lid margins, styes, boils and abscesses of the lids, corneal ulcers, and metastatic uveitis after furuncles and purulent affections of the ethmoid and maxillary antrum. It is a valuable prophylactic agent in operations in the presence of unsterile conjunctivæ and lids.

The *gonococcic* serum is also best made as an autovaccine formed from a culture on blood serum agar, which is washed off after twenty-four hours with a normal salt solution and sterilized at 60° C. It produces active immunization, and is injected subcutaneously. It is possible to buy

the polyvalent *Arthigon-Brock.* The initial dose is 60 million germs, which is increased to 125, and in three injections to 300, and then to 600 and 800 million. It has been of most value in the treatment of metastatic iritis from urethral gonorrhea, but it has been tried also in acute blennorrhea adultorum, though here the results have been more uncertain. v. Szily has made a "sensitized" gonococcus vaccine. Arthigon has been given intravenously in doses of 0.05 to 0.1 in blennorrhea adultorum, which has been followed by healing in five days.

Tetanus serum is used in traumata where there has been a possibility of infection by tetanus. The earliest possible use is advised. One hundred I.-E. are given prophylactically, and after the disease develops, the same dose is given intradurally.

Organotherapy.—The treatment has for its basis the theory that the secretion (incretion) of the internal glands is contained in their tissues or their extracts, and that the substance that is missing as the result of the disease of one of them can be supplied to the body by the internal administration of it. These substances are obtained from the glands of different animals, and are usually given in tablet form, but may also be given in fluid or powder form, or even injected subcutaneously.

The treatment, however, is made more difficult by the fact that the eye lesions which accompany disturbances of the internal secretions are often due to dysfunction of not one gland, but rather of many, since these glands have numerous varying relations with each other, and frequently act antagonistically, so that hyperfunction of one may be caused by the hypofunction of another. In clearing up this relationship, Abderhalden's method has been of great service, and the oculist must use the internist and the serologist in a large number of such cases.

The most frequent of this class of disturbances seen by the oculist are those of the thyroid and of the hypophysis.

We distinguish between disease of the anterior and

middle lobes of the *hypophysis,* while the posterior lobe seems not to have an internal secretion. Hyperfunction of the gland (hyperpituitarism) causes the symptoms of acromegaly, disturbed genital function and mild glycosuria, which conditions can usually not be affected by organotherapy. In disease of the middle lobe, which manifests itself in decreased function (hypopituitarism), with the symptoms of dystrophia adiposogenitalis, underdevelopment, hypoplasia of the genitals and diabetes insipidus, hypophysis and thyroid preparations have proved valuable. Of the hypophysis preparations, those most used are hypophysin sicc. (Merck), pituglandol tablets (three to six daily), hypophysis tablets (Freund and Redlich), hypophysin (Poehl), pituitrin, pituigen, and hypophen (Gehe), which are sometimes given intramuscularly, sometimes subcutaneously, and sometimes even intravenously. Method and dose are indicated on the different preparations.

As the result of the above mentioned interrelations between the glands of internal secretion, one should try, also, thyroid or reproductive gland extracts, from which good results have been obtained. Perhaps Derkum's disease belongs in this category, where bilateral retrobulbar neuritis with central scotoma has been observed, and where distinct improvement has been obtained by the use of hypophysis preparations.

Lesions of the hypophysis manifest themselves in the eye usually in the form of *atrophy of the optic nerve,* with bitemporal, rarely homonymous, hemianopsia, also as disturbances of the muscles, and as increase in intraocular tension in hypofunction. In such cases, the hypophysis and thyroid preparations may be tried. Small doses of iodine sometimes are beneficial. However, when the vision grows worse, these should not be tried too long, but recourse should be had to x-ray, and if this does not help, to operation.

In hyperfunction, as soon as it is seen that large doses

of iodine and x-rays do not help, the patient should be operated upon.

Hypofunction of the *thyroid* causes the well known picture of *myxedema,* with the peculiar swelling of the face and eyelids and falling out of the hair and eyebrows. The presence of cataract with myxedema has been reported, and it is claimed that the thyroid has something to do with keratoconus, certain forms of dystrophia cornealis and intraocular tension. Although thyroid preparations have little influence on cataract or dystrophy, they have a wonderful effect on myxedema. Thyreoidin tablets, 0.1 to 0.3, are given several times a day in carefully increased doses, also thyraden and thyreoglandol tablets, each 0.3. We begin with six a day and increase to 30. Thyreoidin sicc. is given as a powder, 0.1 to 0.2 daily, increasing up to 0.4 daily; also iodothyrin in powder or tablets, 0.2, one to three times daily, increasing to 2.0 to 4.0; children 0.3, once or twice a day.

Thyroid preparations cause a decrease in intraocular pressure, and they have been tried in chronic glaucoma. The fact that intraocular hemorrhages are more quickly absorbed when it is administered, is due to this property of decreasing tension and accelerating absorption. This treatment seems to have had good effect in many cases of keratoconus, also.

On the other hand, amblyopia, neuritis optica and exophthalmus have been reported as the result of thyroid poisoning from long continued use of thyroid tablets.

Hypersecretion of the thyroid causes Basedow's disease, perhaps also cataract and increase of tension. Although the use of thyroid tablets are here contraindicated, antithyreoidin (Moebius) and rodagen may be used. The former is a serum obtained from thyreoidectomized kids, and comes in ampoules of 10 gm. We begin with 10 to 15 drops 3 times daily, increasing 5 drops a day to 90 to 100 drops, and then decrease in the same manner. Ten bottles comprise a cure. Rodagen is a dried milk powder

of thyroidectomized goat, obtainable in tablets of 2.0, or powder; 5 to 10 gm. daily are to be taken several weeks.

Since the *thymus* and the thyroid partially neutralize each other, we may treat Basedow's disease with thymus preparations, perhaps in combination with small doses of iodine (thymoglandol (Freund and Redlich), one to two tablets t. i. d. after meals).

Hypofunction of the *adrenals* is accompanied by pigmentation of the lid margins, the conjunctiva, and limbus, against which may be used various adrenal preparations (tablets of Merck, and Freund and Redlich, paranephrin (Merck), adrenalin (Parke, Davis & Co.), suprarenin hydrochlor, synthet. (Höchst), ischaemin, etc.)

Hyperfunction of the adrenals causes an increase of the blood pressure, and can cause an attack of glaucoma.

Dysfunction or hypofunction of the *parathyroids* causes lamellar cataract and sometimes optic neuritis and pigment degeneration of the posterior layers of the iris. The preparations have no influence on lamellar cataract, and it is not known what influence they have on the other disease said to be caused by the above disease. The preparations are parathyreoidin tablets (Freund & Redlich), parathyreoidin preparation (Beebe, New York), parathyreoidin (Serotherapeutischen Instituts-Mailand).

Since keratoconus is frequently accompanied by an atrophy of the *thymus,* as shown by the Abderhalden reaction, Schnaudigel has advised thymus-opton (Merck) in this disease. It may be obtained in ampoules containing 0.06 of the active substance. The contents of an ampoule is injected in the musculature of the upper arm, at first every four weeks, later every two to four months. The injections are somewhat painful, and sometimes there is headache and malaise for the next few days.

The *sexual* glands probably play a part in hereditary optic atrophy and recurrent vitreal hemorrhages. Spermin (Poehl) has been tried for optic atrophy and general weakness. It is made from the testicles.

Summarizing, although very good results have been obtained in a number of cases where disease of the internal glands is present, it is contraindicated in others, and we are unable to explain the reason for this. We are still in the experimental stage, and without a firm foundation. Glandular therapy, however, should be tried in appropriate cases.

4. Paraspecific, Protein Body, Irritative Therapy

While specific therapy either furnishes the body with prepared antisubstances, or excites it to manufacture antibodies, albuminous bodies are the factor in the nonspecific. This nonspecific irritation can increase the specific function of the cell. And, although in general the specific vaccination therapy is to be preferred to the nonspecific, there are a number of cases in which the specific treatment cannot be employed, and recourse must be had to the nonspecific.

Every vaccine and every serum contains albumin, a nonspecific component, which perhaps is neutral in the presence of the specific, but which perhaps is not entirely inactive, in as much as we can sometimes increase the action of the specific therapy by combining a nonspecific with it. There is some uncertainty about this treatment, since the basis for the dose which must be given is often lacking, so that large amounts of the split products give the opposite action. Likewise we do not know the split products of the introduced albumin, and the condition of the patient plays a role. As the result of these factors, bad results sometimes follow.

The first use of albuminous substances for injection in diseases was by Lüdke, who used deuteroalbumose for this purpose in 1914-1915. R. Schmidt later injected milk for the same purpose, and proposed the conception of protein body therapy, or as it is now more correctly designated, irritative therapy, by bringing together a number of therapeutic and prophylactic data, by which it was shown that

practically all heterogenous sera and vaccines, albuminous bodies and their split products, and other protezens such as nucleinic acid, extract of cartilage, etc., have the power of producing in the body an action similar to that produced by the specific sera and vaccines. A similar action to that produced by albuminous bodies, and in many cases a still stronger one, can be produced by substances that have no relationship to protein bodies, such as colloidal metals, especially silver salts, hypertonic salt solution, turpentine, etc. It is believed that such substances do not produce a direct action, but rather an indirect one as the result of a common cleavage product in the blood (indirect protein body therapy, irritative therapy).

We can therefore put in one class all such remedies, both those that act by *direct parenteral albuminous injection* and those which act by the action of *heterolytic sera and vaccines,* as well as a number of *chemical* substances.

The explanation of protein body therapy is not yet clear in all respects. Apropos of his investigation on the problem of fatigue, Weichardt found that when medium doses of the cleavage products of albuminous bodies with high molecular construction were injected into the animals used for experiment, a transient phase of depression was produced, which was followed by a distinct increase in their power of action. He could demonstrate this by increase in the action of the fatigued heart of the frog, and in the secretion of the glands, etc., and based it upon an increased "protoplasm activation", a belief accepted by R. Schmidt, who stated that the protoplasm was "changed", "re-tuned", so that the same stimulus was able to cause a greater action.

Others regard the process as the expression of an "allergy", which presents itself as the nonspecific effect of a reaction, and is differentiated from the specific by the quantitative difference of the necessary dose. Others claim that the foreign bodies cause the production of defense ferment substances.

These theories are opposed by that of Bier, who claims that the process is simply an irritative one, an increase of hyperemia, inflammation and fever, through which the protein body therapy acts. He substitutes the theory of irritative therapy for that of protein body therapy.

Although our knowledge of the method of action is not cleared up, we can still find in this treatment a welcome addition to our therapy, and one which is capable of further development.

The healing power of protein body therapy has a threefold action:

1. In the production of fever, which, however, may be absent without influencing the curative action. This action is said to be caused by excitation of the temperature center.

2. In a special affinity for the internal secretory defense system (spleen, bone marrow, lymph nodes).

3. In the evoking of a focal reaction in the area of the lesion or focus.

Cow's milk is most frequently used in protein body therapy. It is placed in the water-bath at boiling temperature for 10 minutes, i. e., not boiled itself, and after cooling is ready. If a rise of temperature follows the injection, it is apparent in a few hours, at the latest six to eight hours, and often does not appear after the first injection, in spite of good action, but only after the second. Acceleration of the pulse, malaise and dizziness disappear after forty-eight hours at the most, and sometimes there are chills, rarely sweats. Anaphylactic reactions are very rare, but one must always think of the possibility.

The dose depends on the age of the patient. Children receive 2 to 5 c.c., adults 6 to 10. If cow's milk is not obtainable, boiled goat milk may be used instead—4 c.c. for adults, 1 to 2 for young children, 1.5 to 2 c.c. for older ones.

Instead of boiled cow's milk, the Sächsische Serumwerk

furnishes a sterile preparation from tuberculosis-free cows called *ophthalmosan*. The Firma Beiersdorf sells a fat-free and toxin-free product, *aolan*. The latter is said not to cause fever. Both are furnished in ampoules, and are used in the same dosage as milk.

Injections of milk have proved of especial value in gonorrheal affections of the eye. In both blennorrhea neonatorum and adultorum, the swelling of the lids and the secretion diminish rapidly, and any complicating corneal process is especially favorably influenced. In each case it must be determined how much local treatment is necessary in addition. Diphtheric conjunctival swelling is also favorably influenced. It may be used if there is a fear of anaphylactic reaction on account of a previous injection of antidiphtheric serum. Iritis on a gonorrheic or rheumatic basis has improved as by magic following the injections, both inflammation and pain. They have been used in scrofulous and parenchymatous inflammations of the cornea, and have had an astonishingly favorable effect on the blepharospasm, and in the former have favorably influenced the healing. The action is less pronounced in vitreal opacities, choroidal inflammations and septic diseases. Nevertheless, their use should not be neglected in such severe diseases. The results in sympathetic ophthalmia are also uncertain, both in the case of the disease itself and prophylaxis against wound infection. Its favorable action in ulcus serpens corneae and infectious processes of the cornea has been disputed, but everyone praises its action in albuminuric retinitis, and other forms of retinitis and choroiditis of an infectious nature, as well as in chronic eczema of the lids. No result has been seen in trachoma.

An increase in the action is obtained, according to Schmidt, by one or two instillations of dionin (up to 10 per cent) on the day after the first injection.

All three preparations of milk are injected intramuscularly, usually in the gluteal region. Instead of this, v. Liebermann recommends subcuteaneous injections under

the skin of the abdomen. The value is still undetermined of the intracutaneous injection which has been recently advised, by which vesicles are formed in the skin. The injections are usually made in equal doses with an interval of one to two days, but in blennorrhea of the conjunctiva, the action is better if they are made two days in succession, and then repeated on the fourth and fifth days. If the first two do not achieve the desired action in acute diseases, additional ones are usually of no avail.

By the addition of certain drugs to the milk or albuminous preparations, it has been thought that their action is increased and a certain specific affinity obtained. Haas had a preparation called *vistosan* made, No. I of which contains 0.6 pro mille of strychnine glycerophosphorate; and No. II, 1 pro mille of strych. cacodyl. It is furnished in ampoules of 5 c.c. (Chemische Fabrik Alemannia, Berlin-Wilmersdorf). No. I is said to be valuable in cases of retinal hemorrhage, thrombosis of veins, old and recent choroidal hemorrhages with vitreal opacities, and optic neuritis, even retrobulbar, and it is claimed that it also decreases the tension in absolute glaucoma and lessens the pain. It is useful, also, in infected traumata and corneal diseases. No. II is used in acute and chronic iritis and iridocyclitis, as well as atrophy of the optic nerve.

An attempt has been made to increase the action of casein by the addition of *yatren*. This is iodoxychinolin-sulf. acid, with an iodine content of about 30 per cent, whose iodine is not split off in the body. Combined with casein, as *yatren-casein,* it is used in ophthalmology in iritis and iridocyclitis after trauma, acute trachoma and phlyctenular conjunctivitis. There is a weak yatren-casein composed of 2½ per cent casein and 2½ per cent yatren, and a strong form, with 2½ casein and 5 per cent yatren. In acute inflammations, 0.5 of the strong should be used every two days, increasing to 1 to 3 c.c. In chronic inflammations, one should commence with 0.5 of the weak every two days, likewise increasing to 1 to 3 c.c., and finally

changing to the strong. Severe general or local reaction should be avoided. The injections are usually followed in twelve hours by general disturbances, malaise, headache and fever, as well as focal reactions in the eye, followed in 24 hours by a feeling of improvement. The remedy is given intramuscularly or intravenously, but the latter has sometimes been followed by unpleasant though transient complications.

Next to milk, the most frequently used albuminous body is *caseosan* (5 per cent casein solution), which comes in ampoules containing 5 c.c., which is used in the same way and has the same indications as milk preparations. It is given intramuscularly, subcutaneously or intravenously, but the latter method has been followed by unpleasant general symptoms. Therefore, it would be better not to give it intravenously, or if given, to use smaller doses. The *deuteroalbumose* recommended by Lüdke is given intravenously in 10 per cent solution; and intramuscularly, a 10 per cent aqueous solution of natr. nuclein., 0.1 to 0.6, one to three times daily, with intervals of two days.

Lately, a vegetable albumin has been brought out under the name of *novoprotin,* for whose use there are the same indications as for the above mentioned preparations. It is given in doses of 1 c.c. intramuscularly or intravenously. Following the latter method, severe fever and chills appear in one to two hours after the injection, followed in six to eight hours by euphoria. Bad results have not been noted.

Lecithin, also furnished in ampoules containing 2 c.c. and 5 c.c., has been advised in benzol poisoning, and recently in retrobulbar neuritis, especially in multiple sclerosis and toxic amblyopia, and is given intramuscularly or intravenously. The latter should be made carefully and slowly, taking about five minutes.

Sanarthrit is an alcoholic extract of cartilage, said to be free from albumin, though this has been denied. It is said to be a specific for joint diseases, and should therefore be tried in eye diseases that are related to them. It comes in

ampoules of two strengths. Of No. 1, 2 c.c. are given intravenously. Eight days later, after the symptoms have subsided, 1 c.c. is given. Anaphylactic shock has been seen following the intravenous use of No. 2 strength.

The serum most frequently employed is the *diphtheria* serum (2000-5000 I. E.), which has been especially recommended by Darier in purulent affections of the cornea and infected wounds. He has seen good results from its internal administration, also. It has been used as a prophylactic to prevent wound infection in cataract extraction. Solm saw good results in purulent affections of the cornea from *streptococcus* serum. *Deutschmann's* serum, a preparation obtained from horses fed on yeast, has been used in all purulent diseases of the eyes, in doses of 8 to 10 c.c. given intramuscularly. Braunstein saw the same result from the injection of normal horse serum as from milk. A vaccine of killed *typhoid* bacilli was used by v. Szily and Sternberg as a paraspecific treatment of blennorrhea. It can be used only in large institutions, where it can be prepared easily, and is inferior in general practice to the milk preparations, which are always at hand. Wolff-Eisner prepared a *pollen* vaccine against hay fever (Kaiser-Friedrich-Apotheke, Berlin), which can be used in spring or fall as a prophylactic, but which can be used also after the disease has become manifest; then, however, in larger doses.

Vaccineurin-Dölken, made from cultures of staphylococci and bacilli prodigiosi (Sächsiches Serumwerke) is said to act as a heterovaccine and produce focal reactions of the nerves. It is given intramuscularly and intravenously in neuritis optica and tabetic neuritis, but not in degenerative processes, 1/200 c.c. of the normal vaccine. An active immunization is said to follow six or eight injections.

Finally, *tuberculin* has been used as a nonspecific (?) treatment in sympathetic ophthalmia and ulcus rodens corneae.

Of chemical substances, we must think of *turpentine* and

calcium. The former has been used in conjunctival blennorrhea and staphylococcic diseases (furuncles of the lids, acne). One-tenth to 0.2 to 0.4 of a 20 per cent solution in ol. olivar. or ol. amygdal. is injected into the buttocks, at a point about two fingerbreadths below the margin of the pelvis, on the posterior scapular line. In several injections, the dose is increased to 1.5 to 2.0. The injections are made every three to five days, followed by rest in bed for half a day. *Olobinthin* is more used now, a 10 per cent solution of turpentine in oil, which comes in ampoules of 1.1 c.c., of which 0.4 to 0.5 is given intramuscularly.

A 10 per cent solution of *calcium* (calc. chlor. 1.0, sodium chlor. 30.0, aqu. dest. 100.0) is said to act the same way as injection of milk, but is very painful and sometimes causes small abscesses of the muscles. *Afenil,* a calcium urea combination, is given intravenously, 10 c.c. of a 10 per cent solution. It should be injected very slowly and carefully, and as many as six injections may be made at intervals of two to five days (see also medical therapy). It is recommended in scrofulous diseases of the eyes, sclerosing keratitis, vernal conjunctivitis and hay fever. Opinions as to its value in these diseases vary.

Mirion is a colloidal preparation of iodine, with the advantage of acting specifically in syphilis. Of the dilute solution, 5 c.c. are given twice a week, children 1 to 3 c.c. The usual amount is six to eight injections intramuscularly, but as many as twenty may be given.

Injectosan, a combination of formic acid with natr. lactosacchar. in methylene blue, is given intramuscularly, but according to Schnaudigel, has no advantages over other preparations.

Lauber had favorable results from injections of 40 c.c. of a 25 per cent *sugar* solution in arteriosclerotic neuroretinitis and vitreal opacities following severe rheumatic iritis and chronic iridocyclitis.

The action of hypertonic *salt* solution in lowering intraocular tension should be mentioned here.

Of the colloidal metals, the salts of *silver* should be mentioned, as they have frequently proved useful in septic and infectious diseases of the eyes. As a rule, they are injected intravenously in amounts of 5 to 10 c.c. of a 0.5-2 per cent solution, but a 1 per cent solution may be injected hypodermically. Those most used are *collargol, electrocollargol* and *dispargen,* which come in 5 c.c. ampoules. They have sometimes been used with good results in sympathetic ophthalmia. How much influence the albuminous content (up to 30 per cent) exerts is unknown.

Fulmargin, which has a similar action, is said to be an albumin-free preparation.

Perhaps the undoubted results of the mercurial treatment of nonluetic diseases are to be regarded as due to irritative therapy, an opinion which has also been expressed in regard to the action of sun baths.

Finally, we should speak of the attempts to influence tabes and paralysis and their optic nerve complications by means of inoculation with *bacteria which cause fever.* Wagner v. Jauregg has seen a favorable influence upon these diseases by a tuberculin cure; Binswanger has injected coli bacilli. Weygandt has recently injected the germs of malaria and recurrent fever, which also have been said to have a favorable influence. The resulting disease is afterwards cured with quinine. The results are said to appear in two to three months. We do not yet know how far we can favorably influence the optic nerve diseases in this way, but Wagner says it has a favorable action. In this connection, it must not be forgotten that hypertrophy of the spleen has followed this malaria.

Throughout the whole development of the protein body therapy, the treatment was confined to parenteral injection. The latest experiments, which were carried out on sick—not well—people (Zimmer and Prinz), has shown that at least some of these remedies, which are not materially altered during the process of digestion, but which are absorbed from the intestines, such as yatren and methylene

blue, cause irritative action even upon internal (oral) administration. Thereby, both local and general reactions are caused, the latter of which manifests itself in a sort of sleepiness and dullness (yatren pills). We are here at the threshold of a new procedure, which perhaps will yield as many surprises as did parenteral therapy.

5. Ray and Light Therapy

In ray and light therapy, we must distinguish between the heat and the chemical action of the rays. As distinct from the heat action, we make especial use of electric light baths, the use of which will be discussed in the section on baths.

The natural source of both kinds of rays is *sunlight,* whose favorable influence upon the most different kinds of disease was known both in classical antiquity and to the old Germans. During the middle ages and the succeeding centuries, "heliotherapy" fell into undeserved forgetfulness, and only in the last thirty to forty years has it again been brought into its proper sphere. Although the theories as to the action of sunlight differ somewhat, there is agreement that in its action—probably as the result of the higher value of its spectral composition—it surpasses that of all artificial sources of light, however valuable these are as aids in our comparatively sunless climate. So far as possible, use should be made of this natural source of light and heat.

Raying of the whole body acts beneficially upon metabolism and the increase of red cells and their hemoglobin content. It finds its usefulness in rheumatic and metabolic diseases, and especially in all diseases related to tuberculosis and scrofula.

The *winter* sun of the *high mountains* has the best action. Raying on mountains, therefore, must be different from that in low places and on the seashore. In the mountains, the patient should accustom himself for a few days to the

climate, before he commences treatment. We usually begin raying of parts of the body, such as the feet, the lower limbs, etc., before commencing the raying of the whole body. Raying in the mountains should not last as long as in low places, where we begin with 15 minutes. Then the patient is placed in the shade for half an hour, and then again put in the sun. The patient lies in a reclining chair, with head and eyes protected with Hallauer, smoke-grey, or euphos glasses. An overdose of the treatment must be avoided, as that will cause only injury. The height of the place and the reaction of the patient play an important role in the dosing. Schanz advises that the sun bath be preceded by a water bath to which sea or bath salts have been added, or that the body be kept moist during the bath with water containing salt. The action of the light upon the skin is said thus to be increased.

As a substitute for the sun, a number of apparatuses have been devised, which have in common the fact that they let the chemical blue, violet and ultraviolet rays act on the body. Of the latter, however, only the so-called inner ultraviolet rays, those beyond 300 micra (Schanz), have a curative action, while the others, those this side of 300 micra, cause irritative conditions, and must be excluded.

Finsen was probably the first to devise an apparatus for light treatment, although his was rather for local than general treatment. He used the carbon arc light, which is especially rich in ultraviolet rays. By the use of metallic electrodes, it is possible to increase the content of these rays, but neither these electrodes nor zinc-cadmium electrodes have found further use.

For *superficial* raying with ultraviolet light, we make use of the Finsen lamp of Berg, Siemens' aureol lamp, the dermolamp of the Sanistasgesellschaft of Berlin, and especially the quartz lamp of Cromayer and the mercury quartz lamp. There are many forms of the latter (Höhensonne of Bach, Breiger, Nagelschmidt, Hönig, Hagemann, Jesionek). We cannot go into the details of these here. In the Höhen-

sonne there is a circle of eight incandescent lamps, in order to supply simultaneously sufficient heat. In order to provide for the transmission or absorptions of definite rays, the lamps are provided with a uviol filter. In all lamps, in addition to the distance from the patient and length of exposure, their deterioration and the variations in the current at different times of the day must be taken into consideration.

The *Cromayer* lamp is used to ray the anterior and posterior sides of the trunk. The distance of the quartz lamp from the skin should be about 1 M., and the time of the first exposure should be three minutes. Three minutes is added at each treatment, until the maximal time of 30 minutes is reached. The distance of the lamp is decreased by 10 cm. gradually, until it is 50 cm. away, but should be brought no closer. The treatment is carried out three times a week. The *mercury quartz lamp* of Bach is used in a similar way, at first five minutes, later seven to twelve minutes. After the seventh treatment, it may be used 15 to 25 minutes for several weeks, alternating between the breast and trunk. The distance of light source should be about 1 m. The Jesionek lamp is used similarly.

In the beginning of the use of these lamps, there is a slight erythema of the skin, which is replaced by a gradual pigmentation.

The general *carbon light bath* has not found so general use, its technic has not had uniform results, and its use has not been sufficiently simplified. The most useful form is the Siemens' *aureol lamp* with the large voltaic arc. We begin with ten minutes' duration and 75 cm. distance, increase by five minutes up to thirty minutes, and decrease the distance gradually by 5 cm. up to 50 cm. On the first day the breast is rayed, on the second the back, with the same dose and the same distance. As a consequence of this arrangement, several persons can be rayed at the same time.

In general, in using the Höhensonne lamp, no special

precautions to guard the eyes need be taken, though they should be closed. Unruly children should wear dark glasses of euphos, Hallauer or smoke-gray.

The general raying with the Höhensonne and similar instruments is useful in all forms of tuberculous and scrofulous diseases of the eyes, as well as eczema and blepharitis.

Roentgen and Radium Therapy. Roentgen and radium or mesothorium treatment are of equal value in many cases, supplement each other in many ways, and are frequently profitably used together, so that they can be discussed together.

It would take us too far to discuss the various apparatuses and their construction, and likewise we must refrain from discussing the various tubes (Müller S. H. S., Coolidge, Lilienfeld) and the choice of filters (usually 3 mm. aluminum). The most important thing is to do no harm, and every oculist who is not a member of a Roentgen institute and skilled in the therapy should send his patients to a roentgenologist for treatment, lending his advice in special circumstances. In the same way, the roentgenologist must decide the length of treatment and the intervals between.

Likewise, in the treatment with radium or mesothorium, the biologic activity of the preparation must be determined in each case in order to select the length of time necessary for the production of an erythema. Radium is a product of the disintegration of uranium, and mesothorium of thorium. Radium preparations contain radioactive substances in the form of a radium salt (radium bromide), which retain their radioactivity for decades, while mesothorium loses half of its property in ten years. On account of the differences in the action of the preparations sold by the manufacturers, it is essential to test this action beforehand, that the physician may know the strength and action of his preparation. The radioactive bodies are in the forms of plates, capsules

or tubes, which are laid on the part to be rayed, or are fastened to it with adhesive plaster. Raying with radium or mesothorium in general diseases has the advantage over x-rays, that they can be more easily brought to the spot to be rayed. This is especially true in treatment of the hypophysis (see below), where the 0.5 mm. thick capsule containing the radium can be placed within the epipharynx. There are, also, needles of nickel steel, 20 to 25 mm. long and 2 mm. thick, which can be inserted directly into the wound or the tumor which is to be rayed. Also, there are radium emanations, which are used especially in treatment of the hypophysis, and which by means of appropriate instruments can be shoved up to the floor of the sella turcica. Here, however, it is important to have the necessary distance from the mucous membrane.

There can, of course, be no question of raying the whole body by these rays, but there are a number of general diseases where raying of certain parts of the body is useful.

The upper limit of each treatment is the *erythema dose* of the skin, and one should remain below this if possible. It should be noted here, that after an intensive cure, especially mercurial rubbings, we should wait two to three months before starting a ray treatment, and we should always inquire whether the patient has had a previous ray treatment, and if so, how it affected him. If an iron or arsenic cure has preceded it, the raying should be delayed until these metallic substances have been eliminated from the body. Many patients do not stand the raying well, and are affected by the so-called roentgen symptom, which consists in headache, nausea, vomiting and malaise. Occasionally, an increase of temperature is noticed, but the general opinion is that there is no idiosyncrasy against x-rays.

Of the diseases of the skin, we may mention eczema and lupus. Of eczema, only the subacute and chronic forms are treated, and these are frequently cured by one treatment.

In *scrofulous gland affections,* the treatment is followed not only by local improvement, but also by general.

In *Basedow's disease,* the best results are obtained in those cases where we try to alleviate the symptoms due to disturbances of function. Nervous diarrhea, heart trouble, sweats, and psychic excitations are quickly improved, and the exophthalmos is at times improved also. In general, the treatment is adapted for small strumata, where the thyreotoxic symptoms are most prominent. In large strumata and symptoms of compression, recourse must be had to surgery.

The thyroid may be rayed from in front or either side. If internal or climatic treatment has had no effect, one should try x-rays.

Raying of the *adrenals* in increased blood pressure and arteriosclerosis has resulted in improvement of complicating eye conditions as well as relieving the pain in the region of the hands and feet of old people.

The *spleen* has been rayed in hemorrhages of hemophiliacs, and also as a prophylaxis for the prevention of severe hemorrhage before an operation.

In *Mikulicz' disease,* results have been obtained by slight raying, chiefly hard rays in small doses, of the regions of the parotid and sublingual and submaxilliary glands.

In raying of the *hypophysis,* especially, the glandular hypertrophy and hyperfunction of the gland are favorably influenced, so that by the decreasing of the size of the new growth, the pressure symptoms are decreased, and thus cases where the local symptoms predominate (headache and visual disturbances) are improved. If the organotherapy does not help, or even makes matters worse, we should always try the effect of x-rays. Applications are made from the temples or from in front. X-rays and radium therapy can be combined in such cases, as noted above, and organotherapy and protein body therapy can also be combined with raying. Cases of acromegaly are

less amenable to this treatment, though it may be tried where other forms of treatment are contraindicated.

In radium and mesothorium treatment, the reaction, as stated, depends on the strength of the preparation, the filter used, and the time of application. In superficial raying, no filter is used, or at most, a 0.1 mm. silver one; in deep raying, an aluminum or silver filter of 0.2 to 1.0 mm. thickness is used. The reaction usually reaches its height in from several hours to fourteen days, and lasts six to eight weeks, so that the treatment should not be repeated before two months. The capsule is placed directly on the part to be rayed. If this is smaller than the capsule, the surrounding area must be covered with a lead plaster; large areas should be treated a strip at a time. The action of the radium can be increased by a provoked inflammatory reaction (turpentine oil), that is, a sensitizing, whereas a desensitizing can be obtained by adrenalin applied to the skin. In the latter case, a better deep action is accomplished.

6. Electric Treatment

Electric general treatment scarcely concerns the oculist, and the decision between faradic and galvanic current, electric bath or high frequency current, must be left to the electrotherapeutist. In all nervous diseases of the eye, disease of the optic nerve, and paralysis of muscles, it serves as an adjuvant to the other general treatment. Möbius referred four-fifths of its curative action to suggestion. Although this view may not be always correct, the general electric treatment obtains its best results in neurasthenic and hysteric patients.

The use of the high frequency current in trachoma, paralysis and vitreous opacities has found little use in Germany, and no extensive experiences in regard to it are available.

7. Medical Treatment

The oculist very frequently must use general medical treatment. This is true not only in those diseases which are the local expression of a general disease, such as syphilis, tuberculosis, scrofula, gout and rheumatism, but also in those which are exclusively the domain of the oculist, e. g., sympathetic ophthalmia. Then, there is the amelioration of pain after operations or in severe inflammation, insomnia, and many others, where the oculist cannot neglect general treatment.

The following summary, therefore, contains all those remedies that the oculist needs to use frequently. In order to prevent repetition, I have arranged the remedies in alphabetic order rather than according to the diseases. Part II contains the indications for the use of the various remedies.

Acetanilid, see antifebrin.

Acid. salicyl., 0.5 to 1.0, internally, in rheumatic diseases, usually replaced by sodium salicyl., 1 to 2 gm., for sweating, in combination with hot milk, hot linden flower tea or hot lemonade, in acute disease of the uveal tract, especially those on a rheumatic basis. In vitreal opacities and episcleritis, for a long time, internally, in doses of 0.5 to 1.0, t. i. d. In sympathetic ophthalmia, 6 to 8 gm. for six to seven days, then every second day the same dose.

Salipyrin, same dose and indications. Instead of both, *aspirin* (acid acetosalicyl.) and *soluble aspirin* (calcium salt of aspirin) is taken. Against sympathetic ophthalmia, v. Stock recommends *benzosalin* highly in amounts of 6 to 8 gm. daily.

All of these are also antineuralgic.

Acid. carbolic, recommended in chronic alcoholism and acute carbon bisulphide poisoning (acid carbol. liq., 10.0; natr. chlor., 20.0; natr. phosph., 40.0; natr. sulph., 40.0; aquae, ad 100.0, 50 to 100 c.c. injected daily under the skin of the back).

Adalin, see bromine.

Aethylmorphin hydrochlor., same as dionin, see morphine.

Afenil, see calcium.

Alcohol, 90 per cent, ½ to 1 syringe, in neuralgia, spasmodic tic, at the point of entrance of the facial or the nerve involved.

Alival, see iodine.

Antifebrin, antipyretic and antineuralgic, 0.25 to 0.5, several times a day, 0.5 a dose, 1.0 a day.

Antinervin, see bromine.

Antipyrin, pyrazolon. phenyldimethyl., antipyretic and antineuralgic, dose 0.5 to 1.0, several times a day, also in iodism (see syphilis).

Antisclerosin, Natterer, made from the blood salts, either as Trunecek's inorganic serum or in tablets. The serum is given twice a week subcutaneously; the tablets three times daily, two in ¼ glass of water, one-half hour before meals. They dissolve with difficulty, and must remain in the water for one to two hours. After four to six weeks, an intermission of fourteen days, after which they are again taken for fourteen days, then an interval of fourteen days, etc. They can also be taken alternately with iodine. Indicated in arteriosclerosis and retinal hemorrhages, even the juvenile form.

Antithyreoidin, see thyroid preparations.

Argent. nitrat. internally. Formerly given in tabes and the accompanying optic atrophy in pills of 0.005 to 0.03 several times a day. When used too long, can cause argyrosis of the whole body.

Argent. colloid., collargol. Given intravenously in 0.5 to 2 per cent solution, in septic processes and sympathetic ophthalmia, 5 to 10 c.c., also subcutaneously in 1 per cent solution.

Dispargen, colloid silver in 2 per cent solution, in 5 c.c. ampoules, intravenously, like collargol.

Electrargol, 1¼ per cent solution, subcutaneously or in-

travenously, 5 to 10 c.c. every two or three days, according to indications (see also protein body therapy).

Argochrom, methylene blue silver, containing 2 per cent silver, 0.05 to 0.2 in 5 to 20 c.c. water, given intravenously every day or every other day in septic general infections.

Fulmargin, used in same way.

Arsenic and preparations. *Liq. kali arsen., Fowler's solution,* 0.1 to 0.5 several times a day as drops in optic nerve disease, disease of the lids, neuralgia, spasmodic tic, anemia, multiple sarcomata of the skin and disease of the hypophysis.

Natr. cacodyl., subcutaneously, 0.05, in aqueous solution, in anemia, chlorosis and general debilitating conditions. Expired air and perspiration have the odor of garlic.

Elarson, tablets containing 0.0005, one to two several times a day, after meals. Well borne, especially in secondary anemia and chlorosis, also given with iron.

Solarson, 1 c.c. ampoules, containing 0.003 arsenic, also used for subcutaneous administration, same indication as the preceding. No odorous breath.

Salvarsan, yellow powder, solutions to be neutralized with alkalies (see syphilis).

Neosalvarsan, easily soluble in water, with a neutral reaction. It is used also in toxic amblyopia, 0.3, once a week intravenously, and especially in sympathetic ophthalmia.

Silver-salvarsan, more potent than salvarsan, with the same indications.

Salvarsan natrium, easily soluble in water without decomposition, and acts as well as salvarsan (see syphilis).

Neosilver-salvarsan, see above.

Arsenferratose, a solution of arsenferratin, a combination of albumin, iron and arsenic; children, 3 teaspoonfuls a day, adults, 3 tablespoonfuls.

Arsentriferrin, a solution of arsentriferrol, in the same dose as the above.

Arthigon, a gonococcic vaccine, see serotherapy.

Aspirin, see acid salicyl.

Asurol, see Hydrarg.

Atophan, tablets, 0.5, three to four daily in gouty diseases, iritis, episcleritis, sympathetic ophthalmia.

Aurocantharidin, gold cantharidin, see tuberculosis.

Benzosalin, see acid salicyl.

Biozyme, see yeast preparations.

Bornyval, in neurasthenia, capsules of 0.25, one to two daily.

Bromine and bromine preparations. *Potassium bromide* and *sodium bromide* in excitable and neurasthenic states, also a mild help to sleep, and can be used for a long time. In ophthalmic migraine, is given for a long time in doses of 0.6 to 2.0, several times a day, in powder or solution. *Bromalin,* same indications, 1.0 to 10.0 several times a day.

Bromglidine, bromide combined with plant albumin, 0.5 tablets, one to two several times a day.

Bromipin, solution of bromine in sesame oil, containing 10 per cent bromine, teaspoonful three to four times a day.

Bromural, 0.3 tablets, one to two several times a day.

Adalin, also tablets, 0.5, like the above.

Sedobrol, with fat and extract of meat, with 100 gm. water gives a tasty bouillon.

Sabromin, calcium salt with bromine, 1 gm., corresponding to about 1 to 2 gm. potas. bromide. Protect from light.

Bromine water (Erlenmeyer), a solution of potas. brom., sod. brom., and ammon. brom. in carbonic mineral water, with a sodium chloride content which is said to prevent bromism. The bottles contain 750 gm.; bromine, 10 gm.

Antinervin, antineuralgic, 0.5 internally.

Brucin, see strychnine.

Calcium and preparations. In scrofulosis with tendency to formation of exudates, also against hemorrhage and tendency to it.

Cal. chlor., 0.1 to 0.3 three times daily. Taken for several years, is said to cure hay fever. At the time of pollination, however, the dose must sometimes be increased to five to

seven gm. daily. Wessely recommends in scrofulosis calc. chlor. sicc. 10.0, liq. ammon. anis. 2.0, gum arab. 1.0, saccharin q. s., aqua. ad 200, 1 teaspoonful four times a day. Calc. chlor., 10 per cent, three to seven c.c. intravenously in cocaine poisoning.

Afenil, a combination of calcium with urea, in ampoules, 10 c.c. of a 10 per cent solution being given intramuscularly or intravenously, at intervals of two to five days, in hay fever, spring catarrh and sclerosing keratitis. The injection should be made slowly, taking five minutes. If there is a sensation of heat, wait until the body becomes cool, and then recommence the injection, watching for the warm feeling. Improvement two to three hours after the injection. The eyes are then opened. The ampoules contain 10 c.c.

Calomel, see hydrarg.

Candiolin, an organic combination of prosphorus and calcium (Bayer and Co. Leverkusen), recommended in scrofulosis, rickets, torpid corneal ulcers, and blepharospasm. Three of the tablets are to be taken three times a day, before meals; or a level tablespoonful of the powder, three times a day, in pap or milk (it must not be boiled with the fluid).

Kalzan, a lactic acid calcium preparation in 0.5 tablets, to be taken several times a day.

Tricalcol, a whitish powder, easily soluble in water, 2.5 gm., four times a day, with the same indications as above.

Caseosan, 5 per cent sterile casein solution, see parasepecific therapy.

Cerolin, see yeast.

Chloral hydrat., 0.25 to 3.0, as a hypnotic, to be avoided in delirium.

Chlorylen, a clear fluid, in trifacial neuralgia, scrofulous and herpetic keratitis, and blepharospasm, 20 to 30 drops on some cotton for inhaling, several times a day. It also comes in pearls containing 0.25, two to three several times a day after meals.

Codeine phosph., see morphine.

Coffein, 0.05 to 0.5, in powders for migraine, also in combination with antipyrin as migranin for neuralgia (1.1).

Collargol, see argent.

Curral, urea preparation, hypnotic, tablets, 0.5, take one or two.

Diiodyl, see iodine.

Dionin, see morphine.

Dispargen, see argent.

Dormiol, amylenchloral, 0.5 to 2.0, as hypnotic.

Elarson, see arsenic.

Embarin, see hydrarg.

Feioprot, see iodine.

Electrargol, ¼ per cent, subcutaneously or intravenously, see argent., and protein body therapy.

Ferrum, in very many different forms and preparations, in chlorosis and anemia. *Blaud's pills,* pil. ferri carbon., each pill containing 0.025 iron, one to four pills several times a day after meals. While taking any iron preparation, fresh fruit must be avoided and the diet should be watched. *Syr. ferri iod.* is also much used, containing 5 per cent ferr. iod. with an equal amount of simple syrup, a teaspoonful several times a day. Then there are *triferol, ferratose, ferroglidine,* iron preparations with vegetable albumin, *liq. ferr. albumin. Athenstadt's tincture of Iron, ferr. oxyd. sacch.,* and many others. *Ferrum reduct.* containing 90 per cent pure iron, 0.05 to 0.2 several times a day in pills.

Fibrolysin, see thiosinamin.

Formamint tablets, a combination of formaldehyd and sugar of milk, a disinfectant for the mouth and throat, a prophylaxis against mercurial stomatitis.

Fulmargin, see argent.

Gelatin, in hemorrhages, internally, 5 to 10 per cent solution. Subcutaneously, gel. sterilis Merck, 10 to 40 gm. of a 10 to 20 per cent solution.

Hedonal, hypnotic, 2.0 to 3.0 gm.

Heroin, see morphine.

Hydrargyrum. *Ung. ciner.*, containing 33 per cent Hg., see also syphilis. Used in severe diseases of the uveal tract, in septic and infectious processes as well as in sympathetic ophthalmia. Inunctions of three to six gm.

Hg. bich. corros., internally in pills, in uveal diseases and changes in the macula in high myopia, 0.15 in 30 pills, one three times daily. In case of disturbance of the stomach stop at once, avoid fruit and stimulating foods, to be taken ten minutes after meals.

Hg. biniod flav., see syphilis.

Hg. chlor. mite, Calomel, internally as a laxative in small doses, also in scrofulous keratitis, 0.01, one-half powder twice daily, see syphilis.

Hg. glidine, mercury combined with plant albumin, internally in syphilis.

For other preparations of mercury see paragraph on syphilis.

Hydrast. canaden. fluid extract, 25 to 30 drops three times a day for hay fever.

Hypophysis preparations, see organotherapy.

Kalzan, see calcium.

Iodine and Iodine Preparations. Used in many diseases where an absorptive action is desired, such as hemorrhages, arteriosclerosis and exudates. It lowers the blood pressure through decreasing the vessel tonus and the viscosity of the blood. It is, therefore, employed in many diseases of the heart, blood vessels and joints. For the eye, it is used in all diseases where we desire its twofold action, absorption and decrease of blood pressure, parenchymatous keratitis, all forms of iritis and uveitis, vitreal opacities, optic nerve disease, retinal disease and incipient cataract. See also syphilis.

The *potassium* and *sodium* salts are the ones most frequently used, in doses of 0.1 to 1.0, and even in higher doses, several times a day in aqueous solution or capsules.

Pagenstecher recommends them in scleritis, episcleritis and muscle paralysis, in large doses from the very begin-

ning, in combination with potassium bromide, in order to prevent heart disturbance (K. I. 20.0, K. Br., 7.5, aquae 200, tablespoonful three times a day, immediately after meals). Where the mucous membrane is sensitive, dilute with milk. Soon increase to six tablespoonfuls, and after eight to fourteen days, change to sodium iodide in the same or larger doses. The larger doses are usually well borne. Pagenstecher also gives iodine in diffuse opacities of the lens, in the form of Molts' forehead salve, and has seen clearing up of the opacities. *Jodrubidium* is better borne. Iodine in small doses is often beneficial in Basedow's disease, either *tincture of iodine,* one drop every other day, or one to two per cent solution of K. I., 5 drops six to eight days every month, i. e., 2½ mg. K. I., or 1½ to 3 mg. iodine. The favorable action soon shows itself in remission of the tachycardia. According to Ohlemann, the unfavorable action of iodine is due to the use of too large doses. Other authors, also, have reported favorable results in Basedow's disease from the use of small doses of iodine. Instead of the pure metallic salt, a large number of organic salts have been prepared, where the dose contains less iodine but is better absorbed. They can be ordered with advantage when the metallic salts are not well borne or give rise to severe irritative symptoms. Nevertheless, patients react differently to the different preparations, and one may have to change the drug used. The one most used is *sajodin,* in tablets of 0.5, also with iron as *ironsajodin* in tablets of 0.5, one several times a day. Every tablet contains 25 per cent iodine and 5 per cent iron. *Jodtropon,* also in tablets of 0.5, contains albumin, and is therefore specially indicated when the use of albumin is desired. In combination with iron as *fejoprot,* in chocolate covered tablets, it is well liked by children. Both preparations are well borne. *Jodocitin,* a combination of iodine with a high lecithin content. *Jodglidine,* a combination with plant albumin, also well borne. All come in tablets containing 0.5, to be taken several times a day.

Other combinations are *Jodfortan* (urea with calcium iodide), tablets of 0.25, three to six daily. *Dijodyl,* a combination of a fatty acid with iodine, not absorbed until it gets into the intestines, tablets of 0.3, one to two taken three to four times daily. *Jodipin,* a combination with sesame oil, in 10 per cent solution, teaspoonful two to three times a day, also in tablets of 0.2 gm., one tablet t. i. d. *Jodostarin* tablets, 0.25, several a day. *Jodival,* tablets, 0.3, one to two several times a day. *Jodothyrin,* see organotherapy. *Alival,* almost tasteless powder with 63 per per cent iodine content, 0.3 several times a day; intramuscularly, 1.0 a day dissolved in the smallest possible amount of water.

Of the combinations of iron with iodine, in addition to those already named, there is *jodferratose,* a syrupy solution of jodferratin and iron, for children, three to four tablespoonfuls daily.

If iodine taken internally is not well borne, it can be replaced by *jothion* (jothion 2.0, chloroform 2.0, ol. oliv. ad 20.0). Every day or every other day, 0.2 to 0.4 gm. is rubbed into the arm or some other part of the body for five minutes. The iodine can be found in the urine and saliva in forty-five to sixty minutes.

Instead of jothion, we can use *jodosolvin,* a 15 per cent solution of iodine, or *jodvasogen,* which are absorbed without irritating the skin.

Iodine has also been given intravenously recently, but the reports of the results are contradictory.

Iriphan, strontium salt of atophan, same indications, 0.4 tablets, three to four daily.

Jaborandi, see pilocarpin.

Jodferratose, see iodine.

Kalzan, see calcium.

Lecithin, made from the yolk of the egg, is indicated in neurasthenia and malnutrition. When dissolved in water or normal salt solution and injected subcutaneously, it is said to shorten narcosis and prevent the after-effects.

Three to five c.c. of the sterile 10 per cent emulsion are injected under the skin of the back or intravenously in tobacco amblyopia and carbon bisulphide poisoning, also in retrobulbar neuritis (Römer). It is also used in gout and arteriosclerosis, as it prevents deposit of lime in the tissues.

Levuretin, see yeast. *Levurine* and *levurinose,* ibid.

Luminal, a derivative of veronal, 0.1 several times a day, acts twice as strongly as veronal. The tablets contain 0.1 and 0.3.

Medinal, a hypnotic like veronal, 0.3 to 1.0 several hours before bedtime.

Melubrin, antineuralgic, tablets, 0.5.

Menthol. valerian, see *validol,* 10 to 15 drops on sugar in ophthalmic migraine, and five hours later perhaps another 10 drops.

Coryfin, mentholester, for applying to the inside of the nose, or inhaling in bad colds.

Mergal, see hydrarg. and syphilis.

Merlusan, ibid.

Migränin, see coffein.

Morphin. hydroch. 0.01 to 0.03 internally or subcutaneously in painful diseases of the eye.

Codeine, 0.01 to 0.05, and *Dionin,* 0.01 to 0.03, are used in coughing and as a means of quieting the patient, both as powder or tablets several times daily. *Heroin,* 0.005 to 0.015 three times daily for the same purpose.

Natr. bicarb. 0.5 to 1.5 several times a day in powders in diabetes and acetonemia.

Nirvanol, hypnotic, for motor excitations, 0.25 to 0.5, also subcutaneously. Tablets 0.5; ampoules 4.0, containing 0.5 nirvanol.

Novasurol, see syphilis.

Nucleogen, combination of iron, arsenic and phosphorus with nucleinic acid, one to two tablets, t. i. d. in scrofulosis.

Ol. jecoris aselli. Cod liver oil, rich in vitamin, used in scrofulosis, a teaspoonful several times a day, or capsules,

1.1 to 5.0, also in emulsion and as iron- or iodine-iron-cod liver oil. Phosphorus-cod-liver-oil in rickets.

Olobinthin, see turpentine.

Opium. Sedative and hypnotic, 0.03 to 0.05 up to 0.15. Opium in the same or weaker doses in diabetes to decrease the enormous excretion of the urine.

Opsonogen, polyvalent staphylococcus vaccine, see specific serotherapy.

Paraldehyde, hypnotic and sedative, colorless fluid, 2.0 to 5.0.

Phenacetin. Antineuralgic, 0.5 to 1.0, one to three times a day.

Pilocarpin. Alkaloid from jaborandi leaves, 0.1 to 0.03 subcutaneously for sweating, seldom employed now.

Pituglandol, see organotherapy.

Pituitrin, ibid.

Proponal, like veronal, 0.15 to 0.5 as a hypnotic.

Pyramidon, antineuralgic, 0.2 to 0.5, one to three times daily.

Quinine hydroch. in combination with iron, in nervous asthenopia; with morphine in neuralgic pain (quinine 0.025 to 0.05 several times a day).

Rodagen, see organotherapy.

Rubid. jodat, see iodine.

Sabromin, see bromine.

Salipyrin, see salicylic acid.

Salvarsan, see arsenic and syphilis.

Sedobrol, see bromin.

Secacornin (Roche), 0.01, dilut. spirit. 10.0, 5 to 10 drops three times a day for four to six months, then intermission for two months, then as before. Is said to be useful in cataract.

Silicium and its preparations are adjuvants in tuberculosis. *Silistren* Bayer, fluid, 25 to 30 drops in water three times daily. Children one-half.

Silicol, powder, 0.1, several times daily, or tablets, 1 t. i. d.

Siliquid-Boehringer, 0.3 per cent aqueous colloid solution silicious acid, intravenous, beginning with 1 mg. SiO_2 and increasing to 3 to 5 mg.

Solarsen, see arsenic.

Sanarthrit, see irritative therapy.

Strophanthus, tincture, four to eight to ten drops two to four times a day to lower the blood pressure, advised in glaucoma.

Strychnine nitr., internally in paralysis and toxic amblyopia in pills, 0.01 to 0.02 to 0.03, subcutaneously in amblyopia and optic nerve affections, injected in the temporal region or the arm, 0.0005 to 0.0002 at a dose, daily or every other day.

Brucin, contained in the seed of the strychnine plant, internally in similar doses and with the same indications.

Stypticin (cotarnin. hydrochl.), 0.025 to 0.05 internally or subcutaneously several times a day in retinal hemorrhages and hemorrhagic glaucoma.

Turpentine. Ol. terebinth., see irritative therapy.

Olobinthin-Riedel, 10 per cent solution of turpentine in oil, in ampoules of 1.1 c.c., see irritative therapy.

Thiosinamin, allylthiourea, subcutaneously in 10 per cent solution for softening scars. More used is

Fibrolysin, combination of thiosinamin and sodium salicyl., in ampoules of 2 c.c., subcutaneously in scars, leucomata, vitreal opacities, retrobulbar neuritis, strictures of the lacrimal passages, adhesions of the lid margins, and cicatricial ectropium, 10 injections of 2 c.c. each, given three times a week.

Thyraden, Thyroglandol, Thyrojodin, see organotherapy.

Thyreoidin sicc., Thyreoiserum, ibid.

Tricalcol, see calcium.

Trigemin, analgesic and antineuralgic, 0.5 to 1.0, one to two times a day.

Trional, hypnotic, 1.0 in 200 c.c. fluid after the evening meal.

Trygase, see yeast.

Tuberculin, see tuberculosis.

Urethan, hypnotic, comparatively nonpoisonous, therefore may be used for children, 1.0 to 2.0 to 4.0 in solution.

Uricedin, in gouty diseases, 1.0 to 2.0, two to four times daily.

Valeriana, tincture valer. aether., 20 to 30 drops several times a day, sedative in excitable conditions, in hysteria and neurasthenia.

Valamin, hypnotic, in pearls, 0.25, one to two before retiring.

Valyl, pearls, 0.125, two to three several times daily, sedative.

Validol, see menthol.

Veronal, 0.3 to 0.5 as hypnotic and in excitable states.

Xerase, see yeast.

Yeast preparations, internally in tendency to acne and stye, also for long continued use in rosacea keratitis.

Biozyme, a dry preparation of living yeast, which retains its vitality for a long time, to be taken internally in doses of enough to go on the point of a knife. It also comes in the form of small rods.

Cerolin, a mixture of fat and yeast, pills of 0.1 to 0.2 to be taken three times a day, one-half hour before meals.

Furunkuline, dry yeast, to be taken three times a day in amounts from a teaspoonful to a tablespoonful in water, beer or soup.

Levuritin, levurin and dry beer yeast, teaspoonful three times a day before meals in water, beer or soup.

Trygase, finely granular preparation, teaspoonful several times a day in water or beer.

Xerase, a preparation of 150 parts of dry yeast, 125 parts bolus, 20 parts sugar and 3 parts salt, 3 gm. two to three times a day.

Zymin.

Zittman's decoction, see syphilis.

8. General Use of Cold and Heat, Baths, Bath and Springs Cures

The general cold and heat applications are used in the form of packs and baths.

In *cold packs,* the body is enveloped in a large bath sheet that has been wet with water at a temperature of 12° to 15° C., and the whole body is rubbed by the flat of the hand of the attendant, who also slaps the patient in many places. Face, head, breast and axillae are moistened with water previously, and the treatment is completed with drying and rubbing. In the case of neurasthenics, the bath sheet is wet with water at 36° C., and this is applied for one minute, the patient is dried with a slightly warmed towel, and then the temperature is gradually reduced to 18° C.

Cold baths are seldom used, whereas neutral ones at 34° to 37° C., with addition of cold water or a cold douche are often ordered.

General cold applications find little use in ophthalmology. They are ordered for neurasthenics, and for children who are to be hardened, but their use must be individualized, as neurasthenics frequently cannot stand them.

Warm packs may be ordered either moist or dry. In the latter, the patient is wrapped in warm woolen coverings and surrounded by hot water bottles. In the moist packs, a linen cloth which has been dipped in cold water is laid on a woolen covering, and the patient is placed upon the former, his feet having been previously warmed if they were cold. He is then quickly and carefully wrapped in the covering, so that the wet cloth is not exposed anywhere. Special care must be taken that the cloth is inserted between the knees, and between the arms and the thorax. The patient is allowed to lie so for one or two hours.

Hot baths, excepting cleansing baths, are ordered in ophthalmology almost exclusively in those diseases accompanying general diseases, and in scrofulous and

gouty-rheumatic diseases of the inner and outer membranes of the eye and optic nerve, frequently with the addition of drugs and salts.

The most frequently used of these are those combined with the use of sea salts and similar bath salts. To 250 liters of water are added 2.5 to 12.5 gm. bath salts (Kreuznacher, mother-lye, sea salt), and the patient is allowed to bathe for eight to ten minutes at a temperature of 25 to 28 degrees centigrade. Three baths are given every week, followed by rest, preferably in bed. The length of the treatment is about six weeks.

Sublimate baths (not in a metal tub) are given in hereditary lues (see syphilis).

Likewise, there are a number of preparations for making artificial *carbonic acid gas baths* for patients with arteriosclerosis and disturbances of the heart musculature.

In all tub baths, the patient should sit in water over the shoulders, and the room should be well warmed and ventilated. The temperature of the baths may be as high as 37 to 45 degrees centigrade.

According to Hertel, hot baths exert a favorable influence upon many eye diseases, although the manner of their action is not well understood. Since hot baths increase the blood pressure and thus the action of the heart, they must be used with care and not ordered in retinal hemorrhages or glaucoma. The same is true for Russian steam baths. In the *sweat cures,* the hot tub baths may be supplemented by *hot air baths,* which are in general better borne, but require special arrangements, which is true for the Roman-Irish also. In both, the head must be protected by cold compresses.

The best, most pleasant and most efficacious way of producing a sweat is the *electric light bath.* An octagonal cabinet with a floor surface of 1 sq. m., with an opening above through which the head of the patient protrudes, has a number of 10 c.p. incandescent lights along its wall. It is best if the walls are provided with glass plates. A

thermometer is inserted as far as possible into the cabinet. The lights are turned on in succession, and the opening around the patient's neck is padded with cloths. The rays are allowed to act for about a quarter of an hour, then turned off, and the patient is allowed to perspire for about half an hour longer. Finally, the patient receives a lukewarm bath and must rest for an hour, covered up. For light baths at home, a sweating apparatus has been constructed for the bed, a cylindrical iron apparatus provided with incandescent lights, which is placed over the patient and closed off above and below with woolen coverings. Patients with vascular troubles stand the light baths better than other forms. A cold compress is placed on the head to guard against its being heated too much.

General hot applications and hot baths are ordered for purely local diseases of the eyes as well as for those associated with general diseases, such as rheumatism and colds, iritis, cyclitis, choroidal, retinal and optic nerve diseases, and vitreal opacities. It has already been noted that they should not be used in glaucoma and retinal hemorrhages. The views differ as to their value in retinal detachment. Pagenstecher advises against them, as he saw cases grow worse following them. Furthermore, Bier states that the loss of fluid during the sweat cure had no influence, and that the chief factor is the hyperemia, so that local hot applications often act better.

In addition to the *complete* bath, the *partial* bath is used for certain purposes. Light baths of the *head,* for which there are special apparatuses, are recommended for nonluetic iritis, scleritis and vitreal opacities, as well as retrobulbar neuritis. The depletion through warm *foot baths* is preferred by some. They are used for ten to fifteen minutes, at a temperature of 37 to 45 degrees C. just before retiring, and the action can be increased by the addition of a handful of salt, or a tablespoonful of saltpeter or nitric acid, or a spoonful of mustard meal. Some prefer the so-called *alternating baths,* that is putting the feet alter-

nately in hot and cold baths. They are ordered in tendency to congestion of the head, choroidal and retinal diseases, vitreal opacities, and high myopia.

If conditions permit, the patient can be sent, if necessary, to a light or bath resort, as well for a purely local affection as for one accompanying a general condition.

The mere change of surroundings often acts beneficially. We see chronic blepharitis and conjunctivitis, even trachoma, decidedly improved and even cured, even without local treatment, by a four to six weeks' residence in the air of the forest and mountain, away from the smoke and dust of the city. Such a residence often proves beneficial in high myopia, sometimes in combination with a mild aperient water.

Such a change is often sufficient to cure mild cases of scrofulosis with its manifold lesions of the eyes and skin. Town children, who have suffered from the bad air of the city and the malnutrition so prevalent now, blossom out in the pure air and good nourishment of the country.

In general diseases whose local expression is the ocular lesion, the choice of the resort must be determined by the specific treatment as well as the climatic conditions and the time of year.

In the first place, there is the army of scrofulous and tuberculous diseases of the eye.

In the treatment of the former, the sun baths come first, and next the sea baths.

In general, a cure in a *sun bath resort* should last not less than six weeks. The number of baths, their duration, the strength of the sunlight are best left to the local physician. An existing scrofulous disease is no contraindication to the use of the baths, nor does a flaring up of it demand their cessation. On the other hand, these patients should avoid the action of dusty, salty air. This is not the place to discuss all sun bath resorts. The physician can get this information from the catalogues of bathing resorts. If I discuss some of these places in the following lines, it is not

to be understood as condemning those not mentioned, but it is rather for the purpose of giving the physician certain pointers.

If we wish to give the patient the common advantage of a sea and sun bath, we send him to an East or North Sea resort. In most of these, there are also arrangements for warm sea baths, so that we can add to the action of the bath the influence of the climatic factor on the skin and the metabolism. It is better for patients with easily irritated eyes to go to the East Sea, with its forests; those with less sensitive eyes can stand the North Sea.

The most important of the East Sea resorts is Kolberg, which is the only place, with the exception of Biarritz in France, which has sun and mud baths in addition to sea baths.

Among the North Sea resorts, Wyk on the Föhr has more shady forests than any of the others, and is thus especially suitable for these patients.

Resorts with iodine containing springs are suitable often for the treatment of these diseases (Aachen, Dürkheim, Kreuznach, Tölz, etc.).

In mild forms of tuberculosis, it is often sufficient to reside in a mountain resort, especially a high mountain, such as the Bavarian Alps. Cure of even severe cases has sometimes been obtained merely by residence in such a place. For other patients, the medium ranges, such as the Schwarzwald, the Harz, Thuringia, and the Riesengebirge, are better suited. Above all, one must not send patients with sensitive eyes into sunny, dusty places (Riviera).

Patients with vernal catarrh do better in wooded mountains, while hay fever patients do better in places without vegetation, such as Helgoland.

In glaucoma, the ocean is bad; mountains as high as 1700 M. are favorable.

In anemia and chlorosis, with their varied manifestations in the eye, a bath cure is often advisable. In the mild forms, an air cure at 400 to 800 M. is often sufficient. Too

high altitudes are often not well borne. A residence near the sea is often advantageous for these patients. However, this is not good for others, so one must be careful in prescribing this remedy.

It is better to send the severe forms to resorts with springs of water containing iron or arsenic, where the drinking of the water aids the baths. The most important of the arsenic springs is the Dürkheimer Maxbrunnen. The chalybeate springs are at Pyrmont, Kissingen, Flinsberg, Kudowa, Driburg, Homburg, Langenschwalbach, Reinerz, Polsin, etc.

Of the metabolic diseases, we most frequently have to do with gout, where improvement is to be sought first by means of the drink cure. To this is to be added mud baths, sulphur baths, and mineral water baths. Appropriate places are Bertrich a. d. Mosel, Baden-Baden, Wiesbaden, Salzschlirf, Wildbad i. W., Kolberg and Polzin. Of these, Kolberg adds the action of the sea air to the mud baths.

These patients are often improved by radium baths (Joachimstal).

Diabetics are sent to Neuenahr or the German Karlsbad, Bertrich. Karlsbad and Marienbad are the best foreign baths.

For the great mass of rheumatics the treatment with warm baths is to be recommended (Badenweiler, Schlangenbad, Warmbrunn, Wildbad, i. W.); also warm sea baths, sulphur and mud baths give good results. In addition to the above sun and sea baths, there are Eilsen, Nenndorf bei Hannover and Nauheim.

The frequent conditions of the eyes which are associated with arteriosclerosis or disease of the heart musculature are best treated with baths containing salt and carbonic acid gas, of which the best known are Nauheim and Kudowa, but in addition there are a large number of sun baths to be considered. That it is not good to send arteriosclerotic patients to the sea has already been mentioned.

For neurasthenic conditions, residence in a resort at a

medium altitude is often sufficient, as has already been noted. For the severer cases, iron and arsenic springs are to be recommended. For tabetics and paralytics with opticus disease, we can prescribe strong sea or carbonic acid baths, or chalybeate baths containing carbonic acid gas, if we consider any kind of a bath advisable.

For patients with disturbances of the internal secretions, especially Basedow's disease, it is very beneficial to reside in mountain resorts of 700 to 800 M. or higher; many forms improve following a drink cure with water containing iodine, iron or arsenic.

For the late forms of syphilis, and as an after treatment to the mercury cure, the sulphur springs (Aachen, Kreuth, Nenndorf, etc.) enjoy an ancient popularity. But drink cures with water containing iodine and arsenic often give good results (Dürkheimer Vigiliusquelle, Heilbronner Adelheidsquelle, Kreuznach, Salzschlirf, etc.).

The drink cure can be carried out at home with the natural mineral waters, if the circumstances of the patient do not permit a trip to the resort.

Of the simple alkaline waters (Neuenahr), we prescribe 500 to 800 to 1000 c.c. daily, at a medium room temperature and with an appropriate diet. Of the alkaline sulphur waters, we give diabetics 150 to 800 c.c. Karlsbad Mühlbrunnen, once or twice daily, at a temperature of 20° to 40°, and with an appropriate diet. Gouty patients should drink Karlsbad Sprudel or Marienbad, about the same amount, Marienbad at a temperature of 12° to 15° C. Salzschlirf Bonifaciusquelle is drunk at room temperature, 150 to 200 c.c., one to two times daily.

When drinking bitter waters, the patient must avoid foods which are highly seasoned, or contain fat or acids, also raw fruit. From 200 to 1000 c.c. at the room temperature should be drunk within one-half to one hour.

From 200 to 600 c.c. of sulphur water (Aachen, Nenndorf) at a temperature of 20° to 40° can be drunk in the

morning before breakfast. Foods containing iron or iodine should be then avoided.

Of the chalybeate waters, the Pyrmont, Schwalbach, Driburg, etc., are the ones usually prescribed. From 180 to 900 c.c. are drunk, partly in the morning, partly in the afternoon, at a temperature of 12° to 25° C. Fruit, lettuce and substances containing sulphur are to be avoided, and the same obtains in the case of *levico* water, which is frequently ordered. Of this latter, there is a weaker and a stronger form. We begin with 2 to 4 tablespoonfuls of the weaker one-half to one hour after meals, diluted with water or wine, and increase the dose gradually until at the end of fourteen to twenty days the patient is taking four to eight tablespoonfuls of the stronger. For children the dose is one-half.

Finally, it must be mentioned that a number of these waters have been made artificially (Dr. Sandow's salts). It is not always possible to avoid using these, in case of necessity. However, recent experiments have shown that the manufactured article lacks not only the Genius loci and the Spirit of the Springs, but also many other remedial features.

CHAPTER III

LOCAL TREATMENT

1. Mechanical Treatment

The most important mechanical treatment of the eye is massage. It is said to aid the blood and lymph circulation, also the absorption of old or new deposits.

We distinguish a *rubbing massage,* a *pressure massage* and a *vibration massage,* and we speak also of a *direct* and an *indirect* massage. The latter involves the use of the lids upon the eyeball by means of either the ball of the index finger or of the thumb, or a pledget of cotton.

Herm. Pagenstecher divides *rubbing massage* into circular and radial massage. The latter consists in rubbing the finger in a radial direction from the center of the cornea to the region of the equator of the eye, and every sector of the eye can be so treated. It is especially useful in circumscribed processes of the ocular conjunctiva, the cornea and the sclera (phlyctenulae, keratitis fascicul., episcleral processes). The circular massage consists in a circular movement around the corneal margin, and is used in the treatment of diffuse conditions of the cornea (old maculae corneae, etc.).

The movements should be as quick as possible and not too strong, and the duration one-half to one minute at the most. A more forcible and longer massage, up to five minutes, is used in embolism of the art. cent. retinae.

Direct massage is used in lid and conjunctival affections. The lid or its margin is rubbed, not too strongly and not too quickly, from the nose towards the temple. Setz has described a very effective direct massage. The radial side of the thumb of the left hand is placed on the convex tarsal border of the upper lid, while the index finger of the right

hand is placed longitudinally on the convex tarsal border of the lower lid. If the fingers are gently moved towards each other, the two lids are pressed forward, so that the margins stand away from the eye and the conjunctival surfaces are opposed to each other over a considerable area. While the thumb of the left hand remains quiet, the index finger of the right hand can move the under lid forcibly back and forth, and so can exert any desired pressure on the lids or the conjunctivae without pressing on the eye. This massage is especially indicated in squamous and ulcerative blepharitis, as well as chronic blepharoconjunctivitis, follicular and diffuse swellings after trachoma, the chronic blepharitis of old people with tendency to ectropion, and conjunctivitis sicca. Before using the massage, salve should be inserted into the conjunctival sac (one to five per cent yellow salve, 1 per cent ichthyol salve, 1 per cent noviform salve in ulcers) if their special actions are desired. In trachoma, sublimate ointment (1 to 2000), copper sulphate, 1 per cent, or copper citrate may be used, and in follicular and other diseases of the conjunctiva, 1 per cent ichthyol, 1 per cent potassium iodide, or terminol salve.

Each treatment should last about three minutes, at first daily, and after one and one-half to two weeks, every second day or twice a week.

Direct massage on a particular place on the conjunctiva can be made with a glass rod that is pushed under the lid, while a finger placed on the lid exerts the counterpressure, or the lid may be everted and the conjunctiva massaged directly with the finger or a rod. In either case, a strong massage of a single spot or the entire lid may be carried out without pressure on the eye.

In addition to the indications for massage already mentioned, there are also beginning chalazia or the thickenings remaining after their removal, trachoma, inflammations of the Meibomian glands, follicular catarrh, and corneal opacities, especially when the inflammation is subsiding.

In trachoma, boric acid may be massaged into the everted lid. Massage may be used also in episcleritis (often somewhat painful), phlyctenulae and lens remnants.

A combination of the mechanical with the medicinal treatment is used in the *grattage* of the conjunctiva in trachoma, according to Keinig. A pledget of cotton is saturated with a 0.2 per cent sublimate solution and gently pressed out. The everted lid is rubbed with this rather forcibly. The treatment is repeated after sloughing off of the membrane formed.

In all forms of massage, the untreated eye must always be open, in order to have a control over the treated one.

Of the adnexae of the eye, massage is used in purulent inflammations of the tear sac, especially when it is ectatic. The sac is stroked several times a day from above downwards; this treatment can be left to the patient.

Massage is especially beneficial in neuralgias of the supra- and infraorbital nerves. However, as H. Pagenstecher rightly insists, this must be vigorously done in such cases. The thumb is placed on the incisura supra- or infraorbitalis, and from here the area of distribution of the nerve is vigorously stroked. The pain the first time is great, but soon decreases. The treatment must be made every day for three to five minutes.

In the *pressure* massage of Domec and Darier, the physician stands behind the sitting patient and places the surface of his hand on the latter's temple, and by means of his thumb causes a compression of the eye, by a more or less quick pressure on the cornea from before backwards and outwards, as many as 100 pressings in a minute. This massage causes a temporary decrease in intraocular tension, and Pagenstecher has advised it to decrease the tension in glaucoma, especially as a treatment after operation. Domec claims to have seen recession of a high myopia following it.

For the *vibration* massage, Piesberger has devised a special, small apparatus, electrically driven, by which as

many as 2000 strokes against the cornea may be given. Piesberger recommends it for the quicker absorption of lens masses after discission, for the clearing up of corneal opacities and for the treatment of embolism of the art. cent. retinae. The treatment should not extend over three to five minutes.

Domec has also recommended a *"pneumatic"* massage with a suction cup. The margins of the cup are placed accurately over the lid-covered eyeball. The suction draws the eyeball into the cup. This kind of suction should be used with great care, sucking with inspiration and pushing the piston on expiration. Between twenty and fifty tractions should be made, which is said to cause a rapid amelioration of painful diseases.

To the mechanical methods of treatment belong also the *scraping* of the cornea and conjunctiva. For the latter, Peters has devised a lance-like instrument with a dull edge, by which the conjunctiva of the everted upper or lower lid can be scraped in chronic catarrh of the conjunctiva. He says that the favorable result is due to the removal of the beaker cells and the old epithelium. Tertsch, in trachoma, removes all papillary and brawny tissue by scraping or cutting, the process extending over many treatments at intervals of one to three weeks. However, he also paints the surfaces with a solution of silver nitrate and inserts iodoform salve into the sac. Peters' instrument is useful, also, in scraping off the corneal epithelium in recurrent corneal erosions, as well as in other corneal affections, such as dendritic, herpetic and rosacea keratitis, though in the latter a sharp spoon may be used. The treatment is combined with an immediate or subsequent cauterization with aq. chlori or tinct. of iodine. This process is useful in many cases of ulcus serpens. In gonorrheal ophthalmia adultorum, Bernheimer removes the epithelium with a sharp spoon, having previously injected a novocain-adrenalin solution into the superior and inferior fornices, and paints the wound surfaces with tincture of iodine. The

excess is washed off. Following this, compresses of lead water are made, held in place by a bandage. The after-treatment consists of careful lavage with 0.6 per cent salt solution, frequent retractions of the lids, and dusting with airol powder.

To the domain of mechanical therapy belong also the methods of *expression* of trachoma by means of the Knapp roller forceps and the Kuhnt expressor, as well as the excision of the fornix, with or without removal of the tarsal plate in this disease, also the excision of a part of the optic nerve sheath in choked disc. The latter is described in text books on eye operations.

Local *blood letting* also belongs to the mechanical remedies. For this, the scarificator of v. Graefe is well adapted, or a knife with a broad blade, with which perpendicular incisions can be made in the ectropinized conjunctiva, up to the lid margin. These scarifications are sometimes of great value in acute conjunctivitis with great hypertrophy and swelling of the conjunctiva (trachoma, blennorrhea) as well as certain forms of episcleritis.

Formerly, local blood letting was supplemented by *withdrawal of blood from the temple* with leeches or artificial leeches. Now, this is seldom used; nevertheless, in severe inflammations of the iris and the anterior part of the eyeball, it acts beneficially upon the pain. The opening of small blood vessels has been used in glaucoma, retinal hemorrhages of arteriosclerotic origin, and vitreal opacities and uveitis in myopia. Contraindications are retinitis albuminurica and diabetica, tabetic atrophy and weakened conditions of the body.

Instead of direct removal of blood, Bier's *suction apparatus* has been used recently for the same purpose. Peters says that the loss of blood is not the important factor, but rather its transfer to another place causing an equalization of the intraocular disturbance. Bier's suction cup has a stronger sucking action than the so-called dry cuppings. It is placed on the temple for eight to ten

minutes every two or three days for three weeks. Its use can be left to the patient. It is especially recommended in vitreal opacities in high myopia. There are small cups for stasis in beginning styes, and large oval ones which cover the lids and eye for the treatment of lid abscesses. A method of treating trachoma is based on the principle of Bier's hyperemia, in which a reversed pipette with a piece of rubber tubing on the end is placed on the follicle and suction made until bleeding appears, the follicle ruptures, and its contents is drawn off. This foolishness can be well omitted and the simpler and more efficacious methods of Knapp's roller forceps or the Kuhnt's forceps employed.

Bier's hyperemia of the head has been used in diseases of the lids and tear sac. A 3 cm. wide rubber band is placed around the neck, which is left in place eighteen to twenty-two hours, being loosened when the pain or edema becomes too great. There is no value in this method, and it is distinctly contraindicated in old people and arteriosclerotic changes.

There remains to be mentioned two new methods, whose results, at least the immediate, rest upon their mechanical action, viz., the *vitreous suction* of zur Nedden and the *paracentesis* of Grunert.

Zur Nedden inserted through the sclera into the vitreous a sharp-pointed Record cannula, with a leaf-like lower end, whose lumen was 0.3 to 0.6 to 0.7 to 0.8 mm. The thinnest possible cannula should be used. It is inserted below and out, 6 to 7 mm. from the limbus, and at first only 0.2 c.c. are withdrawn. The amount of fluid to be withdrawn depends on the case, varying between 0.2 and 0.7 c.c., averaging 0.5 c.c. One operation is usually enough, and anyhow, it should not be repeated for three weeks, except in infectious disease of the vitreous. In the latter case, it can be repeated daily and even twice a day. In aphakia, the needle is inserted at the corneoscleral margin, through the aqueous chamber into the vitreous, but in the process

care must be taken that the aqueous does not enter the cannula.

Zur Nedden recommends this treatment in infectious disease of the vitreous, in which it must be commenced as early as possible, in traumatic hemorrhages, even of long duration, and spontaneous hemorrhages due to disease of the blood vessels. In the latter, care must be taken on account of the danger of new hemorrhages. Therefore, the treatment is to be used only in eyes with high myopia and little vision, where there is no hope from other treatment. It is of use, also, in vitreal opacities of uveal origin, but only in eyes free from inflammation; in disseminated choroiditis with great visual disturbance, where all other remedies have failed; and some forms of traumatic and hemorrhagic glaucoma. Contraindications are inflammatory, irritative conditions and cases complicated with high myopia. Very good results have been obtained by this method.

The *paracentesis* treatment of Grunert consists in the opening of the anterior chamber, which is done every two days for eight to ten times, following which 3 per cent dionin is instilled. Indication are diseases of the iris and uvea, vitreal opacities and hemorrhages, obstruction of the vena cent. retin., retinal hemorrhages, retinal disease, and senile degeneration of the macula. There are no other reports as to the results of this little operation.

In paralysis of the ocular muscles, v. Michel has tried mechanical *stretching* of the paralyzed muscle. Its tendon is caught with a strong forceps at its insertion, and the eye is turned in the direction of the action of the paralyzed muscle. He claims an improvement in its movement.

For preventing strabismus and to increase the strength of the eye muscles, especially in muscular asthenopia, mechanical *exercise* has been advised by v. Pflugk and Lucanus. The former has devised a special apparatus, while the latter has the patient fix a finger held in front of him, which is then passed radially before the eye, to in-

crease the motility of the muscles. So far as I know, there are no data concerning the efficacy of the procedure in beginning strabismus. *Stereoscopic* exercises to strengthen the muscles to obtain binocular vision have been recommended both before and after operation (tests of Krull-Perlia, v. Pflugk, Hegg, Dahlfeld, Haussmann, amblyoscope of Krusius).

Finally, mechanical treatment includes *bandaging.* We distinguish *between protective* and *pressure* bandages. The latter is seldom used, except in detachment of the retina, where it is kept in position for eight days after puncture of the sclera. It is used, also, for the prevention of hemorrhage after enucleation or exenteration.

The *protective* bandage has its place in all cases in which we wish to protect the eye against the possibility of being touched or infected from without, in ulcers of the cornea, and following operations. Furthermore, within certain limits, it keeps the eye as quiet as possible, as well as keeping it warm, which has a favorable action on absorption and epithelial formation. It is, therefore, used in different affections of the cornea, especially septic, wound infection, and absorption of hemorrhages. Instead of bandages, we can use celluloid covers or others made of firm material properly fastened. Recently, contact plate has been recommended instead of bandage for corneal disease. Bandaging can be combined with hydropathic applications (see section 2).

Purulent conjunctivitis is a contraindication for bandaging. But, on the other hand, we put a protective bandage over the healthy eye in severe acute conjunctivitis (gonoblennorrhea), in order to prevent its infection. The best form is a watch glass crystal fastened with adhesive or collodion.

2. Warmth and Cold

When cold and warmth are properly used, they are valuable remedies.

The temperature of the conjunctival sac is changed in a few seconds in the direction of the warm or cold application used, and returns to normal very quickly after its removal. The temperature of the tissues behind the eye can be altered in the same way.

Warmth causes an overfilling of the vessels, and considerable redness of the ball; *cold* causes narrowing of the vessels, slowing of the blood current and paleness of the eye.

Too long or too strong application of warmth can injure the corneal epithelium, and can cause circumscribed action on the sclera and retinal detachment (Wessely). It also causes an increase in the amount of albumin and antibodies in the aqueous, and the use of warm drops accelerates the diffusion within the eye (thermaphor, Axenfeld).

The compresses are made in the following manner: We take five to ten folds of bandage or white linen material, large enough to cover the eye and its vicinity, or a corresponding amount of cotton, about seven to eight sq. cm. for adults, and 6 sq. cm. for children. These pads are soaked in the solution, gently pressed out, and laid on the closed eye. As these quickly lose their temperature, they must be changed frequently, and it is always best to have two compresses ready. The temperature of the compresses, lukewarm=20° to 35° C., warm= 35° to 50° C., is best maintained by keeping the containers of the solution in hot water, for which there are special apparatus.

The compresses are repeated for about thirty minutes, sensitive skins being oiled beforehand, especially if there is a tendency to eczema. Afterwards, the patient remains in the room for twenty to thirty minutes. The compresses can be made with boiled water or a weak solution of camomile tea. If accessory action is desired, we can use solutions of boric acid (3 per cent), 1 to 5000 sublimate, 1 to 3000 sublamin, 1 to 5000 hydrarg. oxycyan., 1:2 to 3000 potassium permangan., 1 to 3000 arg. nitr., ¼ per cent acetate of aluminum, 10 drops of alsol in a glass of water,

aqua chlor., either pure or a tablespoonful in 100 to 200 gms. of water, 3 pro mil. zinc, the latter in diplobacilli disease. Instead of the hot, moist compresses, the eye can be covered with a moist compress, over which rubber tissue or Bilroth's cambric is placed, which extends 1 cm. beyond it in all directions. Upon this cotton is placed and fastened with a bandage. This needs to be changed only every three to four hours. However, sensitive skins are macerated, so that a moist dressing should be avoided here as well as in cases with much secretion.

Instead of water, we can use *poultices* of linseed meal or oatmeal or potato meal, which hold water better, but are sometimes not well borne on account of their greater pressure. Dry, warm, medicated pads have been used, also.

Better than these compresses, which quickly become cold, is the *thermaphor* with its constant temperature. These are rubber bags filled with sodium acetate, which dissolves in warm water and gives out heat on again crystallizing. It can be used dry or on a moist dressing. Many patients cannot stand its pressure, which is also true for the Japanese stoves and methyl alcohol heaters. Still better are the electric thermaphors, of which there are various kinds (Reiniger, Gebbert and Schall).

Intense warmth may be applied to the eye by the means of *steam douches,* also. An inhalation apparatus is used for this purpose, and the hot steam is allowed to strike the open eye. However, care must be exercised with this, and the temperature not allowed to exceed 45° C., and cause scalding of the corneal epithelium. Wessely devised a steam cauterant for the treatment of ulcus serpens, the results of which have been very much praised. Instead of steam, hot air has been recommended, especially in the treatment of keratoconus, also eczematous inflammations of the lids, where it is used at a distance of 10 to 15 cm. until the lesion is dry. This so-called *atmotherapy* is said to be useful in all diseases of the anterior part of the eye.

The most active means for the production of high tem-

perature that we have is *diathermia*. So far, this has been little used, usually because it requires a special and costly apparatus. Its advantage consists in the fact that warmth can be applied to the deeper as well as the more superficial parts of the eyeball. We cannot discuss here the different kinds of apparatus. The electric current is led from the eye to the neck. The active electrode, according to Quirin and Zahn, should be placed on the closed lids, while the inactive one is placed on the neck. However, according to Koeppe, for the action of the current it is especially important that the lids be open and not closed. For this purpose, a glass chamber filled with conducting fluid is placed over the open eye, and special eye electrodes must be used. When Quirin's electrode is used, a piece of cotton covered with gauze, about ½ cm. thick, is placed under the neck electrode, and a fine, porous sponge covered with gauze is placed over the eye, both being saturated with a lukewarm, fairly concentrated salt solution. Previously, a conjunctival thermometer is placed in the conjunctival sac, whose tube is fastened to a clamp carried on a band around the forehead, to which the eye electrode is fastened. The neck electrode is likewise held by a band. For diathermia of the open eye, Bucky has devised an electrode consisting of a hollow glass cup filled with salt solution. According to Quirin, in order to avoid the moist pad, the neck electrode can be made of thin strips of lead, tinfoil, or nickeled brass, which can be placed directly on the skin, whereby a better action of the current is obtained.

In diathermia of the eye, the current must not exceed 400 m.a. Contraindications are all diseases with tendency to hemorrhage, such as hemophilia, chronic nephritis, arteriosclerosis, and phthisis with cavity formation. It should not be used on women during the menses or pregnancy, or in disease of the thyroid or when suppuration is present.

If we wish to influence the outer skin of the lid, Quirin's electrode is to be preferred. During the first minute, the

current is raised to 0.2 to 0.3 amp., is increased after two minutes to 0.4 amp., and every two minutes afterwards by 0.1 amp., until a feeling of warmth appears. The duration of the treatment after this is ten to fifteen minutes. The pads must be moistened repeatedly.

The chief indications are the different forms of trigeminal neuralgia, herpes zoster, and perhaps trigeminal tic douloureux. There are not sufficient reports as to its value in diseases of the skin, but it is said to be especially valuable in lupus and skin carcinoma of the ocular region, for which special instruments are necessary.

Diathermia has been tried in conjunctivitis of gouty or rheumatic origin, and in bacterial forms, especially gonorrheic, also vernal catarrh, trachoma and episcleritis.

Previously, we must test whether anesthesia for heat is present in the region of the eye, for, if this is present, the patient cannot tell when the sensation of warmth appears, so that the current can be stopped. In diathermia of the conjunctival sac, 200 to 300 m.a. is sufficient, at first three to five minutes, later somewhat longer.

In the use of diathermia for the anterior part of the eye, as already noted, the most important result is the increase of the albuminous and antibody content of the aqueous. A longer treatment with weaker current produces relatively greater increase in albumin. The temperature of the conjunctival sac should not rise over 45° C., since higher causes corneal opacity and chemosis.

Favorable reports have been given in the following diseases: parenchymatous keratitis and scleritis, especially of gouty or rheumatic origin, old aqueous hemorrhages and inflammatory processes in the anterior chamber, gouty, rheumatic and gonorrheic iritis and iridocyclitis. It is not to be used in septic, infectious processes and hypopyon. Diathermia has been tried, also, in tumors of the limbus.

Its action has been often tried in disease of the posterior segment of the eyeball, such as recent and old opacities and especially hemorrhages from contusions. Currents of 2 to

3 m.a. are used for five minutes. Contraindications are fresh hemorrhages following retinal periphlebitis.

Best says it should be tried in tabetic optic atrophy and retrobulbar neuritis. Since it causes an increase in intraocular tension, it is contraindicated in glaucoma and suspicion of glaucoma, also in all septic diseases of the orbit, cornea, iris, as well as in Basedow's disease and disturbances of sensibility of the lids and cornea.

Just as with warm compresses, so *cold compresses* with frequent changes can be made, and drugs can be added to the cold water also. Instead of the compresses, small rubber icebags may be used, which retain the cold better and permit a better action. They should be fastened to the bedpost, in order to prevent pressure on the eye. To decrease the action of the cold, a towel can be placed between the bag and the skin. There are also bags with two compartments; in the lower, which accurately fits the eye is water, and in the upper is ice. Complicated apparatus such as the Leiter's tubes can be dispensed with in practice.

Cold douches are valuable in many complaints. Douches are small irrigators with a rubber tube supplied with a small spray. It is allowed to act upon the closed lids at a distance of 30 to 50 cm., the flow being directed in the form of a reclining figure 8.

The discussion about *eye baths* will be found in the section devoted to local medical treatment.

Special mention must be made of the use of cold in the form of *carbonic acid snow.* The gas is allowed to escape from the container into a bag, and from the white masses of snow produced, there is formed in a cylinder of wood a small rod, which is held for a few seconds in contact with the place to be treated. Sometimes the treatment must be repeated several times. A small membrane is formed, which is cast off in a few days. It is of great value in small telangiectases and angiomata.

The indications for the use of *heat* have been partially

given in the section dealing with diathermia. In addition to diseases of the lids (styes, furuncles, abscesses), it is serviceable in diphtheric and croupous conjunctivitis, and has been recommended by many in blennorrheic. As a whole, it is used in all diseases of the cornea, iris, ciliary body and septic-infectious processes of the anterior segment of the eyeball. It acts not only by promoting absorption, but also by relieving pain. Its indications in the posterior segment of the eyeball have been mentioned in connection with diathermia.

Cold applications find their use in acute conjunctivitis, chronic catarrh, conjunctivitis sicca, follicular catarrh, and acute trachoma. Corneal complications are not a contra-indication, but the results are not so favorable when these are present.

3. Light and Ray Treatment

As in general treatment, so in local treatment, rays from artificial sources are to be considered in addition to those of the sun.

Seidel rays with *direct sunlight* which passes through a hole of 2 mm. diameter and falls on a sheet of cardboard of 10 to 12 cm. He directs the isolated rays upon the disease focus, and thus prevents dazzling and injury of the retina. He has used the treatment in tuberculosis of the iris and episcleritis with good results. Schanz, also, has tried direct sunlight in large tubercles of the iris, by concentrating the sunlight on the lesion with a dark blue uviol lens. However, he avoids a sharp focus of the lens, since the heat developed would be unpleasant. He uses an area near the focus, and justly demands that the physician himself should always do such raying.

In severe tuberculous affections of the eye, Schanz has the patient wear spectacles made of this glass, and advises him to let the sun shine on the eye through these glasses without directly looking at it.

In trachoma, direct raying of the diseased areas has been tried by means of a lens of 10 to 12 D.

The weather and the season naturally limit this treatment somewhat, as a result of which, *artificial sources of light* have been employed.

As already mentioned in the general discussion, Finsen was led to the use of the *carbon arc light* because of its high content of ultraviolet rays. Schanz favors the filtered rays of this light, and excludes the rays this side of 300 micra by means of a 5 mm. thick uviol glass. Finsen, and later Lundsgard, has seen very good results from the use of the Finsen light in the treatment of lupus and tuberculosis of the conjunctiva, while Schanz has seen this in tubercular iritis and scrofular diseases of the eye. The eye is sensitized by instillation of a fluorescein solution, and the skin by a prior painting with a 0.1 to 1 per cent eosin or erythrosin solution. In purulent infiltration of the cornea and infected corneal wounds, optochin acts as a sensitizer.

Koeppe recommends for raying the cone of rays from the *Nernst slit lamp,* while Shanz claims the white hot Nernst bodies as well as the quartz lamp are inferior to the carbon arc light, and Koeppe states that the strongest and quickest action is obtained through the latter. In addition to these, there are the mercury-uviol lamps, and other sources of rays.

In using the rays, one must avoid dazzling, too great heat concentration, and the part of the ultraviolet rays that are injurious to the eye.

The eyes are protected against the heat rays by a 3 cm. thick layer of a 5 per cent alum solution, or a solution of the same strength of sulphate or chloride of iron, or a 10 per cent solution of sulphate or acetate of copper, the latter absorbing the infrared, the dark red and a small part of the bright red rays. According to Koeppe, the best solution is a mixture of 10 per cent copper acetate with 1 per cent gentian violet, which is almost chemically unchangeable and transmits only indigo and violet of the luminous rays.

Schanz interposes a uviol or dark blue glass of similar action, though Voigt and Koeppe states that this transmits not only small amounts of red rays, but also tissue injuring ultraviolet. In order to exclude every trace of these irritating rays, Koeppe adds to the above solution a 1 pro mil. äsculin solution.

A still more effective filter is said to consist of crystal violet 0.2, copper sulphate 100, to 300 of water in a thickness of 3 cm.

The action of the light is understandable only if the rays are absorbed by the affected tissue, which is followed by a physiologic irritation of the cells, causing an increase of function. At the same time, the action of the short waves in splitting off oxygen has an effect (Hertel).

The apparatus devised by Koeppe has a therapeutic action not only on the anterior part of the eyeball, but also on the posterior, the retina and choroid, and finds its best application in tuberculous diseases (associated, of course, with a tuberculin cure), as well as scrofulous infiltrations, phlyctenulæ, episcleritis tuberc., and retinal periphlebitis with exudates and hemorrhages. The results have been very satisfactory.

For raying, Schanz uses the *arc light with reflector* of Siemens and Halske, in front of which he places a 5 mm. thick, dark blue uviol glass, to prevent injury to the eye. He has had a special cabinet made in which three patients can be rayed at the same time. He has found the treatment efficacious in all forms of scrofulous inflammations and tuberculous iritis. Lately, he has extended the treatment to the vitreous and the deeper parts of the eye. He uses unfiltered rays, when the eyes are closed, for the treatment of eczema of the lids and the vicinity.

The *Finsen lamp* has found its chief use in trachoma and lupus or tuberculosis of the conjunctiva. According to Grönlund, the raying lasts five to forty minutes, and the greatest number of treatments is seven.

The raying is followed by hyperemia, and after about

24 hours, there is a membranous deposit on the conjunctiva, and sometimes edema of the lids. At first, it is advisable to ray only four to ten minutes, in order to learn the reaction of the tissue to the irritation. The same purpose is served by the *Kromayer quartz lamp,* where the quartz applicator can be placed directly upon the everted conjunctiva. Lundsgard says the Finsen lamp is better in the treatment of lupus, and uses his own everter and pressure glass.

Chotzen and Kuznitzky have reported upon the results obtained with the *quartz lamp.* There are special attachments for the eye, for more delicate dosing and localization. The lamp devised by Heussner under the name *Sollux-Ergänzunglampe* can be used for the same purpose.

The technic devised at the Breslau clinic for the quartz lamp was: anesthetizing with cocaine or holocaine, the glass rod of the lamp ¼ to 1 cm. away from the eye. For the raying of the conjunctiva, a quartz attachment, shaped like a lid plate, with a metallic protector on the side next to the eyeball, was used. The length of the treatment was five to twenty minutes. After this, the eye is greatly injected, there is much tearing and secretion, with slight edema of the conjunctiva and vesicular detachment of the corneal epithelium. The irritation reaches its maximum in twenty-four to forty-eight hours, and then completely disappears. The treatment has been found beneficial especially in torpid forms of keratitis. Painful sensations are controlled by 2 per cent cocaine, firm bandage and pyramidon.

Passow states, that raying of the cornea with a quartz lamp 60 to 80 cm. away from the eye for five minutes does not injure the eye and is effective. He rays only the affected areas, protecting the rest of the eye with a shield. In general, the distance from the eye must be governed by the irritation. In nonirritated eyes, it should be 60 to 70 cm.; in slightly irritated, 60 to 80 cm.; in moderately irritated, 100 cm. The raying is done daily or every second

day, according to the state of the eye. To prevent irritation of the skin, where the uviol glass is not used, it should be sprayed.

Birch-Hirchfeld uses an arc lamp *(microarc lamp, Zeiss),* in front of which is placed a quartz lens of 20 D. and a uviol glass. By means of a second quartz lens held in the hand, the bundle of rays are directed to the area to be treated, e. g., the margin of an ulcus serpens. A raying of five to ten minutes does not injure the tissues and has a beneficial action on the pain. At first, the raying is done for five minutes twice a day, later once a day. In addition to ulcus serpens, the treatment has been beneficial in superficial keratitis after corneal abrasion, ulcers in pannus, and torpid marginal and eczematous ulcers. In bad cases, he rays once or twice daily for two to five minutes, after sensitizing the cornea with fluorescein.

There remains to be mentioned the raying of ulcus serpens with a 40 candle bulb in *violet* glass, with a parabolic reflector, which is held at 60 cm. from the eye for twenty-five minutes, the patient looking at the light.

Ray therapy is contraindicated in hypertrophic catarrh with keratitis.

Of the other forms of treatment with monochromatic light, we must mention *red light,* which is recommended as a remedy for the injury to the skin caused by the irritative ultraviolet rays and quartz light. It is advised, also, in erysipelas, dermatitis following sunburn, pigment anomalies, and acute moist and dry eczema of the skin.

A local *"negative light therapy"* (Hertel) is used in all cases of severe inflammations of the eye with photophobia, and in the dazzling sensations in immature cataract and inflammations of the choroid and the retina. Likewise we order protective glasses for severe dazzling caused by the sun or snow, and they should be of gray, euphos or Hallauer glass. The choice of transmissibility depends on the disease and the subjective sensations; e. g., darker ones are ordered for mountain trips and balloon journeys, and

very dark ones for protection against the electric arc light. Where there is an error of refraction, this can be incorporated in the protective glass. The glasses ordinarily used have the disadvantage, usually of not much importance, of not having a similar color throughout. This is overcome in the Zeiss umbral glass, which is colored equally everywhere and possesses the power of light absorption of 25, 50, 65 and 80 per cent.

Moreover, one must be careful not to make himself more sensitive to light by wearing such glasses too long or too strong.

Blue glasses, which permit the passage of the chemically active light rays are no longer ordered, except in special cases (see Schanz above).

X-rays and *radium* have been recommended in a number of eye diseases. The technic and precautions have been discussed in the general part. In spite of the difficulties in the exact dosage, distance from the eye, time of treatment and choice of hardness of rays, it can be considered established, that by paying careful attention to the technic, which is possibly only in the Roentgen institutes of universities and large hospitals, injury to the eye, especially the retina, will not occur, with the possible exception of a cataract, developing years later. However, Kümmell saw decrease of corneal sensibility with loosening of the epithelium, lesions which healed without bad results.

For the protection of the eyes, we may use hollow protheses filled with glycerin, or the protheses of lead glass devised by Stargardt and made by the Firma Müller-Wiesbaden. These are placed on the cocainized eye after they have been moistened with a physiologic salt solution. Various sizes are necessary. The lids and cilia can be protected with bismuth paste, and the rest of the vicinity with lead plates.

Unfortunately, many of the descriptions of cases treated do not give details concerning the tube used, the kind of rays or the intervals between treatments. There is much

to be done yet to overcome the groping which still exists in ray therapy. At any rate, one should wait several weeks after each treatment, in order to observe the reaction of the eye and the action of the rays on the process present. On the average, we do not repeat the raying until six weeks have elapsed. We use the Lilienfeld tube and aluminum filter of 3 mm. thickness.

As to the indications, the raying of primary skin carcinoma of the lid, if not too extensive, is the method of choice. Even when extensive, one should not neglect to try it before operating. If the tumor involves the conjunctiva, this should be rayed, also. The lid is everted and held in position by adhesive, the eye, as noted above, protected by a prothesis, and the lids and cilia protected by bismuth paste. If the raying is not beneficial, one must not wait until the conditions for operation are no longer favorable. Lupus of the lid, eczema and ulcerous marginal blepharitis and multiple, recurrent styes are improved by small doses of the soft rays. In the case of nevus, warts, lymphomata of the lids and conjunctiva, angiomata and keloids, raying should be tried before operating. Many authors have praised its action in trifacial neuralgia. In lacrimation, the lacrimal gland has been successfully rayed (½ H. E. D., 25 to 30 cm. focal distance, 3 mm. aluminum filter, protection of the eye by a prothesis). One treatment is usually enough.

In lupus of the conjunctiva, the Finsen treatment is probably less dangerous, but is more tedious and requires more time. The results have been fairly good in trachoma, where disappearance of the granules and decrease of the infiltration, with clearing up of the pannus, has been seen. The raying has been done through the lid as well as upon the everted lid, the eye being protected with a prothesis; but in pannus, the eyeball has been rayed also. To reach the fornices properly, a double eversion of the lids is necessary (hard rays, 3 mm. aluminum filter, interval of four weeks).

Good results have been obtained in vernal conjunctivitis and in tuberculosis of the conjunctiva (½ H. E. D. to the focus).

Herpes corneæ, parenchymatous and scrofulous keratitis, recurrent erosions, dystrophia epithelialis, and old opacities of the cornea (slight amount of the soft rays in four to five treatments) have been rayed. But the tumors of the corneal limbus, melanotic sarcoma and carcinoma, yield readily to this treatment and should always be rayed before operation. Raying should always follow the latter. Of the deeper lesions, melting away of the nodules and cure of iris tubercles have been seen, and the same is true of iris cysts—sometimes after previous incision. Distinct improvement of vitreal opacities which had resisted all other forms of treatment has been seen.

In sympathetic ophthalmia, Seefelder saw in six weeks a complete disappearance of the irritation of the sympathizing eye following twenty-seven days of raying it with very hard rays. Hessberg, by the use of strong doses, was able to free from pain, at least temporarily, an eye blind from glaucoma hemorrhagicum, and these observations have been confirmed by others. The eyeball has been successfully rayed in intraocular hemorrhages, also.

In the general part, I have discussed raying of the hypophysis in diseases of the optic nerve. Raying after the operation has also been advised. I have seen no results in detachment of the retina.

Of special importance are the results which have been obtained in glioma of the retina. Although, so far, a complete cure has not been obtained by the use of the x-rays, there is no question that degeneration and disappearance of the nodules take place during the treatment, which, however, does not prevent the appearance of new ones. Of course, the treatment when only one eye is involved is justified only when the relatives are strongly opposed to its enucleation. If, however, both are affected, or if the tumor appears in the second eye following the removal of the

first, we should try roentgentherapy even if only temporary improvement is obtained. We should use hard, filtered rays, or large amounts of radium or mesothorium (Axenfeld). It should be mentioned here, that after some time a cataract is seen in the rayed eye, probably as the result of the raying.

In melanosarcoma of the choroid, good results have been reported by some, to which are opposed the unfavorable reports of others. Raying has no effect on metastatic choroidal carcinoma. Nevertheless, just as in glioma, raying should be done following the operation. In contrast to skin carcinoma, sarcomata of the lids have been treated without result so far. Although here the operation is the first line of attack, subsequent raying must not be neglected. Of course, inoperable cases should be rayed, which usually causes a decrease in the pain (hard rays, 3 mm. aluminum filter, intervals of four to six weeks, applied from the directions of the forehead and the temple).

As already noted, the indications for radium are practically those for the x-rays. The advantage of radium is that it is easier to bring it to the area to be treated, and, therefore, it is more convenient for the treatment of a number of diseases of the outer part of the eye, for example, carcinoma of the skin of the lid. Its use in keloids has been praised, also. Favorable results have been seen in conjunctival diseases, such as trachoma and lupus, and also in vernal conjunctivitis and many forms of keratitis. Elschnig recommends it especially in rosacea keratitis, which has been very quickly cured by two to four applications of three minutes. It has been found beneficial in rodent ulcer of the cornea, episcleritis and tuberculous uveitis (30 minutes, ½ cm. distance). It has also been used in carcinoma of the lid, angioma of the lid and xanthelasma. Koster recommends it in myopia gravis and the form called by him cyclitic myopia. Darier, by personal experience, found it helped in ophthalmic migraine with scintillating scotoma.

Franklin and Cordes used it in cataract where the vision was not less than 0.5. The closed lids were covered with a cotton pad, and 10 mg. of radium bromide were used twice a week for four weeks, later once a week, and still later once a month. The silver capsule, with walls ½ mm. thick, was fastened about 12 cm. from the eye. The skin must be protected from secondary rays.

In special cases, x-rays and radium can be combined with quartz light and diathermia.

Light and ray therapy can be summarized as follows:

Light with Short Wave Length

Conjunctiva: Tuberculosis, trachoma, trachomatous pannus, vernal conjunctivitis.

Cornea: Superficial keratitis, herpes, erosion, infected wounds, serpent ulcer, marginal ulcer, severe scrofulous inflammation, tuberculosis, parenchymatous keratitis.

Iris: Tuberculosis.

Roentgen Rays and Radium

Lids: The various forms of tumors and keloids.

Conjunctiva: Tuberculosis, lupus, trachoma with or without pannus, lymphoma and lymphangioma.

Cornea: Superficial inflammations, epibulbar tumor.

Iris: Tuberculosis, cysts.

Eyeball: Hemorrhagic glaucoma, intraocular hemorrhage, sympathetic ophthalmia.

After Raying: After removal of tumors from the orbit and other operations; should be tried in inoperable tumors of the orbit.

The part of the eyeball which is not being treated must be protected by pads.

Contraindications are decrease in the sensitiveness of the eye, increased tension, cataracts (see the communications of Franklin) and vascular changes in the eye.

4. Local Medical Therapy

As in the general part, so in this special part, I will not group remedies together as astringents, antiseptics, etc., as there are too many transition stages between them, and many which are not impeccable share the same bed. Furthermore, there are a number of new remedies which cannot be grouped under the usual classifications. Accordingly, I have used the alphabetic arrangement here, and have grouped only a few that belong to a distinct class, such as mydriatics and miotics.

In local treatment, we use drugs in various ways and forms. The most common is the *aqueous solution,* sometimes the *oily, salves,* and rarely the *powder* or *stick.* In the treatment of diseases of the lids, *dusting compounds* have been recommended. In many cases, the use of the so-called "kompretten" *(discs)* is very helpful, as they permit the use of definite amounts of the drug in the eye. Very good forms are furnished in Germany by Merck.

Drops and droppers should always be aseptic, which is best obtained by boiling in the usual way. It is advisable in the case of drops used daily to add an antiseptic to such solutions as cocaine and atropine, to keep them as free as possible from germs (sublimate, 1:10,000; Hg. oxycyan., 1:5000; asterol, 1:3000). If the drops are slightly warm, they enter the eye more quickly and are more active. There are special thermaphors for this purpose (Axenfeld).

Salves are usually brought into the eye by means of a glass rod, but there are tubes with glass, syringe-like attachments. The salve has the advantage of remaining longer in the conjunctival sac and thus acts better, and some drugs are better borne when used for a long time in the form of a salve (atropine). The use of the salve is better in diseases of the lids and the skin.

The *powders* used are calomel, especially, more rarely dionin, iodoform, xeroform, noviform, and occasionally atropine. They are introduced by a small sterile brush or

a powder blower, or, as the case of dionin, by means of a glass rod covered with vaseline.

The most frequently used *stick* is the copper sulphate pencil in trachoma, also the copper aluminate, and then the alum stick, especially in chronic and follicular catarrh of the conjunctiva. The silver nitrate stick is used only in disease of the lid or the skin; the mild silver stick (arg. nit. 1: kal. nit. 2) occasionally in gonoblennorrhea. In the case of silver nitrate and copper aluminate sticks, Merck has *glass rods* upon which the drug has been melted, which are to be used only once. Small foci are best cauterized according to the method of Pagenstecher by *medicated probe,* which is made by melting a crystal of silver nitrate on the point of a lacrimal probe.

As already stated, the *discs* of *Merck* are very useful. They contain atropine, cocaine, dionin, homatropine, or physostigmine, as well as combinations of various alkaloids. They are introduced either with a toothless forceps, or what is still better, with a glass rod covered with vaseline.

If an extensive flushing of the eye is desired, as after caustics or burns, an *undine* is used or an *eye bath,** of which there are many forms. The most frequent is a small glass cup which is filled with the solution and pressed firmly against the orbital walls. The head is thrown back, and all parts of the eye are washed by opening and closing the lids. The fluid should not be too cold—about 20 to 22 degrees C. Other baths are that of Teich, which has a receptacle for the overflow, and that of Meyer-Steinegg, which has a conduit for the overflow to run through. The fluid used in cataract is a solution of kal. or natr. chlor. with natr. bicarb. and a small amount of ol. foenic, or ol. menth. piper. The action is said to be increased by the addition of guaiac-saponin (Merck). The combination may

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* The translator is opposed to the use of the eye bath on theoretical and practical grounds.

be obtained in tablet form, 1 to 100 c.c. of water, and the treatment should last two to five minutes.

In addition to the medical action, there is a removal of mucus, dirt and secretion in conjunctival disease.

Dor and v. Pflugk have provided the cup with a rubber ring, which seals the instrument better.

If a still more profuse lavage of the eye is desired, as in the case of cauterizing or burns, the undine is perhaps better adapted. It is desired to dilute and neutralize the chemical cauterant as much as possible. In gonoblennorrhea neon. and adult., Kalt flushes the eye with a solution of kali. perman. 1:5000. He has devised a small attachment that is inserted between the lids. The same result can probably be obtained in a simpler manner by means of an undine or a pad of cotton that is saturated with the solution. Previous to operations, the conjunctiva is flushed with sublimate 1-6:10000, Hg. oxycyn., 1:5000; or ½ per cent perhydrol solution. That the solutions act better when they are lukewarm than when cold has already been mentioned.

In speaking of local medical treatment, we must mention *subconjunctival injections,* whose introduction is due to Darier, although v. Rothmund preceded him in their use. Darier first used a sublimate solution, expecting to influence the internal inflammation through the action of the mercury. This expectation has proved unsubstantiated, and instead of sublimate, we now use a solution of salt of 2, 3, 10, 20 per cent as a rule, and for special purposes mercury oxycyan., iodides, dionin and asterol. Subconjunctival injection of a few drops of cocaine (10 per cent) before an operation causes a loss of sensation in the deeper parts of the eye (iris). To the above solutions, 2 per cent cocaine or novocaine is added in order to make the injection less painful. Where it is especially painful, as in the case of dionin and Hg. oxycyan., the previous injection of a few drops of 1 per cent acoin is recommended.

The action of the injections probably rests upon the

excitation of the metabolism, which leads to an increase of decomposition products, and especially to an increase in the albumin in the anterior chamber. Changes in the retina have also been noted (glycogen). At least, the injections have proved very serviceable in many cases, as well in the posterior as in the anterior part of the eye, and have found increased use, as in keratitis parenchymatosa, chronic inflammatory processes in the uvea, old and recent choroiditis, retinitis and affections of the vitreous.

Usually, 3 to 4 per cent solution of sodium chloride is not exceeded, whose injection, with the addition of novocaine, is almost painless. Stronger solutions (10 to 20 per cent) have been tried in detachment of the retina, accompanied by cauterizing of the sclera or previous puncture of it. These injections are very painful and require the subcutaneous use of morphine. The favorable reports of this treatment are opposed by unfavorable ones.

As stated above, in addition to salt solutions, there are others, such as Hg. oxycyan. in septic processes, very painful; 2 to 2½ per cent potassium iodide, also with addition of 2 per cent sodium chloride, in incipient cataract and disease of the anterior or posterior uvea. Then, there is 10 per cent iodipin solution, 0.2 to 0.3 c.c., every eight days for scleritis and sclerosing keratitis (addition of 2½ per cent cocaine); 1 to 5 per cent hetol solution, with addition of cocaine, especially for tuberculous processes of the uvea. Natr. cit. is used in amotio retinae and glaucoma. In the former, de Wecker has used injections of gelatin. Failures have been recorded in all these except iodipin and hetol.

Dionin, on account of its lymphagogic action, is recommended in diseases of the fundus, purulent keratitis and septic diseases, especially combined with Hg. oxycyan. As these injections are very painful, we first inject a few drops of 1 per cent acoin, and later the other (dionin 2 per cent, Hg. oxycyn. 1:5000 āā.).

For tuberculous iritis, Koster injected air, which was

sucked through a cotton pad into a syringe with a red hot needle. Other remedies recommended are 15 per cent alcohol, radioactive substances, hydrogen peroxide, etc., but they have not received general acceptance.

The technic of the injection is very simple. After cocainizing, the conjunctiva is lifted by the point of the needle 2-5 mm. from the corneal margin, the needle is inserted and the contents of the syringe injected. The eye is then bandaged for a few hours. The injections are made every second day, occasionally daily. It is well to change the site of the injection—above, above and out, above and in, etc.

Subconjunctival injections cause transitory increase of tension, which disappears in a few hours, and, therefore, care is necessary in patients with increased tension. The injection should not be made too far posteriorly, as experiments have shown that the action then is not so favorable. If the injections are continued too long, the conjunctiva becomes adherent to Tenon's capsule, especially after sublimate and Hg. oxycyan. injections. These have even been followed by necrosis of the conjunctiva.

Acidum acet. dilut., 1 drop to 10 to 20 g. water, for assuaging the itching of vernal conjunctivitis; addition of a few drops to Hg. oxycyan., 0.0025: 10 of water, has been recommended also.

Acid. boric., 2 to 3 per cent for lavage and for instillation in vernal conjunctivitis; has only a slight antiseptic action. In a 2 to 3 per cent salve for blepharitis ciliar. In combination with natr. bibor. and 4 to 5 drops of suprarenin to 10 vaseline, it has also been recommended for this disease. In powder form on the everted lid, it is used for massage in trachoma.

Natr. bibor. or *tetrabor.* in 3 per cent sol., used as drops in vernal conjunctivitis and as an eye bath; as a powder; a pinch in a glass of water for compresses.

Byrolin: borolanolinglycerin in tubes, used on sensitive skins.

Acid. carbol. liquefact., for cauterizing infiltrated areas and the margin of ulcus serp., by a swab dipped in the solution. It is of little value in compresses and lavage, as its action is too irritative, even in weak dilutions.

Acid. citric. The freshly filtered juice of the lemon with equal parts of pure glycerin and 1 per cent morphine solution is instilled in croupous and diphtheric conjunctivitis.

Acid. gallic., 0.5, with ol. lavandul, 4 drops, ol. ricin. 2.0, vaseline 5.0, is used for alopecia ciliaris. It is to be smeared lightly on the margin of the lid in the morning.

Acid. picrinic. in 1 per cent sol. for touching blepharitis ulceros. In ulcus serpens or ulc. rod. corneae, the bottom of the ulcer should be touched with a probe or pledget of cotton moistened with a pure or 5 per cent sol. The excess of the acid causes a slight whitish clouding of the epithelium, which disappears in one to two days. Cocaine should be used beforehand. In the form of a salve, 0.2:10.0, it is used in lime burns.

Acid. lactic. is used in herpetic and dendritic keratitis. The lesions are touched with a steel pen moistened in the solution. This is followed by rather severe pain, but leaves very delicate opacities. It has been used by Axenfeld in tuberculosis of the conjunctiva, the individual ulcers being touched with a pure or 50 per cent sol.

Acid. pyrogallic. oxid. 1 per cent (pyroxalin), 0.01 to 0.05:10 water, or aq. borac. and aq, foenic. āā 5.0, is used for instillation in chronic conjunctivitis and blepharitis.

Acid. salicyl. is used as a salve, 0.1 to 0.2:10 vaselin, in blepharitis cil. squam., to be applied in the evening. In seborrhea: ac. sal. 0.5, ol. ricin. 3.0, zinc oxid. and talc., aa 20.0, glycerin and aqua aa 22.0, is used as a dusting powder. In a solution of 3:500 it is used as a lavage. As a salve, 0.35 to 0.6:30.0 lanolin, it is used twice a day with massage in corneal forms of vernal conjunctivitis, after previous anesthetizing with cocaine.

Acid. tannic., ½ to 1 per cent solution, for instillation in chronic catarrhal conjunctivitis.

Acid. trichloracet. The crystals are used in the treatment of xanthelasma of the lids.

Acoin in aqueous solution dropped into the conjunctival sac does not act as an anesthetic, but injected subconjunctivally, it has such action, which lasts several hours, and therefore is used as an addition to cocaine in subconjunctival injections (½ per cent). When dionin or Hg. oxycyan. are to be injected, 1 to 2 degrees of a 1 per cent solution of acoin is previously injected.

Acoin oil, 1 per cent, is used for pain in ulc. corn. and iritis, 3 to 4 drops being used several times a day. It burns rather smartly, but quickly stops the pain. It must be kept in the dark.

Actol, see argent.

Adrenalin, see suprarenal preparations.

Ethylmorphin. hydrochlor., dionin, see morphine.

Airol, see bismuth.

Aesorcin, 10 to 20 per cent, to stain the cornea.

Alcohol, 96 per cent or absolute, is used as a dressing in beginning panophthalmia or as a disinfecting compress. It may be used for subconjunctival injection in 15 per cent sol., 1 c.c., at intervals of two to three days, two to four injections in all, under the same indications as sodium chloride. In painful, blind eyes, retrobulbar injections of alcohol may be made.

Alsol, see alum.

Alum in 1 per cent sol. is used in chronic catarrhal conjunctivitis, but in follicular forms the stick is better.

Alum. acet. in ¼-½ per cent sol. is used for compresses. It is beneficial for the itching in vernal conjunctivitis, and is useful in blepharitis ulcer., burns and as a vehicle for alkaloids.

Alsol, a solution of alumin. acet.-tartar., 10 drops to a glass of water, is used for compresses.

Blenolenicet salve, composed of euvaselin and lenicet

(alumin. acet.), is used in 10 per cent strength for painting the conjunctival sac in blennorrhea neonat., every two to three hours, after removal of the secretion. After the secretion has decreased, the 5 per cent salve is to be used three to five times a day.

Ormizet, 6 per cent sol. of alumin. format. with twice the amount of the alkalin sulphat, is instilled three times daily in conjunctivitis, and is used, also, in washing out the lacrimal sac.

Alypin, is an anesthetic in 1 per cent solution, does not act on the pupil or vessels. In iontophoresis, it may be used instead of cocaine, also for anesthetizing infiltrations.

Ammonium chlor., 2 to 10 per cent sol., used as an eye bath in lime deposits in the cornea; a 4 to 5 per cent sol. with a solution of acid. tartar., 0.02 to 0.1, may be used several times a day for an hour or less.

Ammonium lact., 10 per cent sol., for iontophoresis, positive pole on the eye, in lime opacities of the cornea.

Ammonium tartar. neutral, 10 per cent sol. for clearing up lime opacities of the cornea, in the form of an eye bath, used several times a day; is used in lead deposits also.

Amyl nitrit, to be inhaled in angiospastic conditions of the retina.

Anesthesin (Ritsert), with equal parts of boric acid for dusting in hay fever; in solution, 0.3:15.0 ol. oliv., is used in vernal conjunctivitis.

Anesthetics.* See acoin, alypin, cocaine, eucaine, eusemin, holocaine, novocaine, stovaine, tropacocaine, yohimbin.

Aq. chlor., see chlorine.

Aq. laurocerasi, a few drops added to other solution for "swell patients".

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* Butyn, a synthetic preparation, may be used instead of cocaine for anesthetizing the cornea and conjunctiva. In a 2 per cent solution, dropped into the conjunctival sac, four drops at intervals of two to five minutes, it acts almost as quickly as cocaine, does not dry the cornea, and does not dilate the pupil.—Translator.

Arecolin. hydrobrom., the alkaloid of the aureca nut, miotic, ½ to 1 per cent in glaucoma instead of pilocarpin or eserin. Is said to act stronger and be cheaper than the former.

Argentamin, see argent.

Argentum, used as argent. nitr. in 1 to 1.5 to 2 per cent sol. in purulent conditions of the conjunctiva, blennorrhea neon. and adult. The solution is applied with a clean brush or pledget of cotton to the conjunctiva of the everted lid, and the excess is washed off with water or a physiologic salt solution. (Ordinary spring water usually contains enough NaCl.) Instead of this method, a more frequent instillation of a weaker solution, up to ¼ per cent, is recommended. It may be used prophylactically in the form of a 1 per cent sol., if blennorrhea neonator. is to be expected. Continuous use is followed by argyrosis of the conjunctiva. The solutions are to be kept in dark bottles.

Argent. nitr. fus., silver nitrate stick, is used for cauterizing granulations and fistulae, and in blepharitis ulcerosa. *Argent. nitr. c. kal. nitr. fus.,* mild silver nitrate stick, 1 part silver to 2 parts potassium, is used for the same purpose, occasionally in profuse conjunctival suppuration, but then only by the experienced oculist and always followed by a flushing with salt solution.

Argent. acet. dissolves in water only to ½ per cent sol., is said to be less painful than the above and has the same indications. In sensitive patients, it is well to cocainize the conjunctiva before using silver solutions.

Argentamin, 5 to 10 per cent sol. for painting the conjunctiva in inflammations, is said to possess a distinct deep action and is less irritating than the silver solutions, but is not stable. It must be followed by lavage.

Instead of the *inorganic* compounds, there are now a large number of *colloidal* and *albuminous* preparations in use, which are less painful and may be used by the patient at home. Nevertheless, a certain amount of precaution must be observed, as some of them cause argyrosis.

Argent. colloidale, Collargol, 1 per cent salve in conjunctivitis.

Actol, silver lactate, in fissures of the canthi, compresses in eczema, 1:500-1000, or as a salve, 0.5:10.

Argent. citric., itrol, a dusting powder in wounds, one to two times daily upon the everted lid in trachoma, also used in blennorrhea.

Argyrol, silvervitellin, 5 to 10 per cent in blennorrhea neon. and dacryocystitis.

Ichthargan, silver ichthyolsulphate, 2 per cent sol., for eye drops.

Protargol, a compound of silver and albumin, 2½ per cent; *syrgol,* 2, 3, 5 per cent; *sophol,* a compound of silver and nuclein, 5 per cent. All three are used in the prophylaxis and treatment of blennorrhea neonatorum. They have the advantage of being less painful and may be used by the patient at home, but on long use produce argyrosis. In mild cases of blennorrhea, they are sufficient, but in severe cases they must be coupled with other treatments. A 5 per cent sol. of protargol is used for syringing the lacrimal sac and passageways when they are diseased. In blepharoconjunctivitis, it is used as a salve (protarg., 1.5; zinc oxide, 1.0; vaseline, 15).

The solutions should always be fresh and cold. Syrgol is said to kill gonococci especially quickly, without irritating the conjunctiva.

There are suppositories of cocoa butter and 5 per cent protargol, 3 mm. long, for the treatment of lacrimal sac disease, introduced with silver tube.

Collargol and *electrocollargol* (Heyden) are used in aqueous solution or as a 2 per cent salve several times a day in conjunctivitis and blennorrhea neon. They are used, also, as a powder on the everted lid.

Largin, a silver albumin compound, is used in a 0.3 to 0.5 per cent for lavage or for eye drops, one to two daily, in conjunctivitis.

Arnica, tinct. arnic., 10 to 40 drops in a glass of water for compresses in contusions of the lid.

Aristol and aristol oil, see iodine.

Atrabilin, see suprarenal preparations.

Asterol, see hydrargyrum.

Atropine, alkaloid of atropa belladonna, used as atropine sulf. in ½ to 1 per cent sol., or as a salve in the same strength, in acute and chronic diseases of the iris and cornea, scleritis and episcleritis. It was formerly often used against progressive myopia, but this has now been abandoned. It is used in convergent strabismus for paralyzing the accommodation, and for dilating the pupil in central cataract that has not advanced too far. For a better sterilization of the solution, the addition of a weak antiseptic is recommended (sublimat, 1:10000; asterol, 1:3-5000). After long use of the drops, rarely the salve, a follicular catarrh can appear, necessitating replacing of the atropine by some other remedy. To prevent symptoms of poisoning, the tear sac should be compressed in order to prevent the entrance of the solution into the nose and thence into the alimentary canal. Symptoms of beginning poisoning are rapid pulse, dryness of the throat, flushing of the face, dizziness and delirium. The dryness of the throat is overcome by the drinking of milk. A 10 per cent solution is said to have a stronger action and to cause no greater symptoms of poisoning. Powdered atropine has been placed in the conjunctival sac in order to produce especially strong action. The discs, either of atropine alone or combined with cocaine or dionin, are said to be very active. In older people, atropine should be used with care, as it may cause a rise of intraocular tension.

The most usual substitutes are:

Scopolamin. hydrobrom., an alkaloid of scopolia atrop., more toxic than atropine, used in ¼ to ½ per cent solutions.

Hyoscin. hydrobrom, ¼ to ⅓ per cent solutions; the preparation furnished is usually the same as scopolamine.

Duboisin. sulf., from duboisia myoporoid., a mixture of scopolamine and hyoscine, ¼ to ½ per cent.

Eumydrin, 1 to 2 per cent, not as quick acting or as powerful, but one-fifth as poisonous. A 10 per cent solution is said to have a quicker and more permanent action than ½ per cent atropine.

Atroscin, related to hyoscine, 0.1 per cent sol., weaker than atropine, and used chiefly for diagnostic dilatation of the pupil or mild irritations.

Homatropin. hydrobrom., 1 per cent; *Ephedrin*, 10 per cent; *mydrin* (Merck, composed of 1 part homatropine and 100 parts 10 per cent ephedrin solution); *methylatropin. hydrobrom.* in 10 per cent sol.: all four are used for diagnostic dilatations, and in all four the mydriasis and disturbance of accommodation disappear in a few hours. The synthetic drug *euphthalmin hydrochlor.* is used for the same purpose in 5 to 10 per cent solution.

Azodalen, see scarlet red.

Balsam. Peruvian. with ol. ricin., aa 1.0:ol. oliv. 8.0, is used in ulcus serp. corn. and dendritic and eczematous keratitis, also in chronic catarrh. The eye is cocainized, the solution is well shaken, and the ulcer is touched with a pledget of cotton dipped in it.

Bismuth and its preparations. *Bis. subnit.* is used as a salve in seborrhea of the lids, eczema and burns (bis. subnit. 10.0, zinc oxide 2.0, vasel. alb. 30.0). It is used as a lid salve in 1 to 2 per cent strength.

Airol (bismutoxyiodigallat) is used as a lid salve and in burns, 5.0:20.0. It is recommended as a powder in the treatment of blennorrhea neonat. After the lid is everted, it is applied with a brush or glass rod, and is converted by the tears into a puree, whereupon the lid is turned back. This is done 1 to 2 times daily. Airol salve does not act in the same way, but has been beneficial in 5 per cent strength in diseases of the conjunctiva and cornea.

Dermatol (bis. subgal.) is used as a dusting powder in conjunctival and lid wounds, and as a 10 per cent salve

with bandage in keratitis dendritica, ulcus serpens, and scrofulous conjunctivitis with much secretion, though in the latter it is used as a dusting powder also.

Noviform in 5 to 10 per cent salve is used in blepharitis cil., conjunctivitis catar. and phlycten., and ulcers of the cornea, also as a dusting powder.

Xeroform (bis. tribromphenyl.), used as a dusting powder for wounds and as a substitute for iodoform, as it has no odor.

Blenolenicet salve, see alum.

Calabar bean, see physostigmin.

Cadmium sulf., now rarely used, an astringent in ¼ per cent sol. Used by Landolt-Gygax in leucoma corneae (0.05 cadmium, aquae 4.0, gummi arab. 2.0, ext. opii 0.1).

Calomel, see hydrarg.

Carbo animal. (Merck). In blennorrhea neonatorum the conjunctiva is to be dusted twice a day, care being taken to protect the fold of transmission. One hour later the charcoal should be washed out with potassium perman., and these lavages should be regularly carried out. It has been tried, also, in membranous conjunctivitis and serpent ulcer.

Chinin. hydrochlor., in 1 per cent sol. in corneal ulcers, the drops being instilled for several minutes four to five times a day. It is used for lavage also. Of the quinine derivatives, *optochin* (ethylhydrocuprein) is used for pneumococcic ulcers of the cornea. Energetic swabbing of the ulcer with a 2 per cent sol., with instillation of the same solution every one or two hours. For after treatment, instillation of a 1 per cent sol. once or twice a day. In iontophoresis in corneal serpent ulcer, optochin passes through the cornea in three minutes. In hay fever, after all secretion has been removed from the nose, every part is painted with a solution of optochin 0.25, glycerin. pur., 2.0, aq. des. ad 25.0; the same solution may be dropped into the conjunctival sac after cocainizing. The painting should be done every second day, and the drops used between

times. For photophobia, a 2 per cent solution is recommended, but the views as to its value vary. The solution loses its power quickly on standing, and therefore should be as fresh as possible.

Vuzin (octylhydrocuprein) is used in a dilution of 1:10000 for deep infiltration of the tissues in purulent inflammations.

Rivanol, also a quinine derivative (oxyethyldiaminoakridin) is instilled in ¼ per cent sol. every hour in acute conjunctivitis. It dissolves only in hot solution and hastens cure considerably.

There are no data as to how valuable are the other quinine derivatives, which cause anesthesia of the cornea.

Chlorine, as aq. chlor., pure or diluted, is used in purulent conjunctivitis for compresses, 1 tablespoonful in a glass of water. In full strength, it is used to paint the cornea after abrasions.

Chlorylen is used for inhalations, twenty drops on a pad of cotton two or three times a day, but the pad must not touch the nose. It causes hypesthesia of the cornea in herpes corn., superficial disease of the cornea and eczematous keratitis, and is good for trifacial neuralgia and photophobia.

Choleval, colloidal preparation of sodium gallat and 10 per cent silver. The 1 per cent sol. is used as a prophylactic against blennorrhea neon., also for drops when the disease is present.

Clauden, an extract of lung tissue, is used to stop parenchymatous bleeding.

Coagulen, the same indications, is an extract of milk and blood, comes as a powder from which a 10 per cent sol. is to be prepared just before using.

Cocaine, an alkaloid from the leaves of the coca bush, as an acid salt acts as an anesthetic upon the nerves of the cornea and conjunctiva, contracts the vessels, and causes dilatation of the pupil and the palpebral orifice through irritation of the sympathetic. It is used in a solution of

2 to 5 per cent, or a salve, to put the eye at rest during examination, for painless painting of the cornea with silver, for the removal of foreign bodies, and for major and minor operations. In painful diseases of the cornea it should be used with care, as it injuries the epithelial covering. It is used subcutaneously in all forms of blepharospasm, and for akinesis of the lids during operation.

It is used as a powder with adrenalin for blowing into the nose in retrobulbar neuritis, in connection with light baths of the head (Van der Hoeve).

In subcutaneous use, it is usually replaced by *novocaine* in 1 to 2 per cent sol., whose activity is increased by the addition of suprarenin. For local anesthetizing, novocaine is used in 10 per cent sol. It is less toxic than cocaine, but also less powerful.

Stovaine, in 4 per cent sol., and *tropacocaine,* in 3 to 5 per cent sol., are local anesthetics, but are weaker than cocaine.

Collargol, see argentum.

Collodium, for securing light dressings. Addition of ol. ricin. prevents contraction of the surface, elastic collodium).

Collyrium adstring. luteum, solution of zinc with addition of camphor dissolved in alcohol, to be instilled several times a day in chronic conjunctivitis. Diluted 1 to 3 parts to 10 parts water.

Cusylol, see cuprum.

Cuprum sulph., in substance as a pencil in trachoma.

Cupr. alumin. fus. or lapis divinus, a combination of copper with alum, is likewise used in trachoma or severe follicular conditions. The glass rods of Merck with cupr. alum. fused on them, are very useful for single treatments.

Cu. sulf. in solution of 0.01:10.0, or as a salve, 0.025:10.0 is used in chronic and follicular conjunctivitis. A solution of 1:10 in glycerin is used in trachoma.

Cu. cit., or *cuprocitrol,* 5 to 10 per cent salve in trachoma

for massaging several times a day, comes under the name of *terminol cream.*

Cuprol, an organic compound with nucleinic acid, containing 6 per cent copper, is used in a 10 per cent sol. in acute and chronic conjunctivitis, and irritates very little. In the powder form, it is used in trachoma, being dusted upon the everted lid daily or three times a week.

Cusylol, dissolved copper citrate, is used for treatment of trachoma.

Daturin, from datura stramonium, is occasionally used instead of atropine, in the same strength.

Dermatol, basic bismuth gallate, q. v.

Dionin, see opium.

Duboisin sulph., from duboisia myoporoides, see atropine.

Ephedrin hydrochl. in 10 per cent sol., see atropine.

Eserin. sulph. and *salicyl.,* see physostigmine.

Epinephrin, see suprarenal preparations.

Epirenan, ibid.

Eucaine hydrochlor. and lact. An anesthetic, weaker than cocaine, causes no mydriasis, 2 per cent sol.

Eucerin. anhydr. takes up 300 per cent water, and is therefore very suitable for salve base instead of lanolin.

Eumydrin, see atropine.

Ephedrin hydrochl. synthet., a synthesized salt for dilating the pupil. See atropine.

Europhen, an odorless powder containing large amounts of iodine. Is a substitute for iodoform and used in the same way. Used in skin wounds 1:10 collodium elast., or as a salve, 1.5; ol. oliv., 3.5; vaselin, 40.0. See iodine.

Eusemin. A sol. of cocaine and suprarenin in physiologic salt solution for local anesthesia.

Euvaseline. Vaseline hardened by natural wax, base for a salve.

Fibrolysin, see thiosinamin.

Fluorescein, used to stain areas of the cornea denuded of epithelium, 0.4:07. natr. carb.: 20.0 aquae, 2 drops, followed

by lavage. The areas are colored a distinct green. It is given internally, also, for diagnostic purposes.

Formaldehyde sol., in 40 per cent sol. known as *formalin.* In sol. of 1:1500-3000 for lavage and compresses, easily irritates the conjunctiva. Formalin is used as a paste in ulcus serp., applied several times a day. In inoperable tumors it acts as a deodorant and styptic. We begin with a 5 to 10 per cent sol. and increase to 40 per cent. It is used in furuncles, after they have been incised, by painting them one to two times daily with a 10 per cent sol.

Gelatin (steril. Merck), subconjunctival injections of 1 c.c. in retinal hemorrhages and vitreal opacities.

Glycerin, for making salves; also, with cup. sulph., 1:10, for trachoma.

Graminol, dried and pulverized beef serum, removed while cattle are feeding on blooming grass. It is dusted into the conjunctival sac in hay fever.

Greifswald Color Mixture (Grübler) has a specific action in diplobacilli conjunctivitis, but is not to be used when the cornea is involved. It burns severely, and may not be given to the patient.

Guiacol, with tint. iod., aa 10, glycerin 80, is used as a liniment in erysipelas. In oil, 1:50, it is said to have an antiseptic and anesthetizing action in wounds of the cornea and conjunctiva.

Hetol (sod. cinnam.) is used subconjunctivally in 1 per cent sol., in herpes cornea, filamentous and dendritic keratitis and corneal ulcer, also in parenchymatous keratitis, iritis and scleritis on a tuberculous base. Every two days, 0.5 c.c. It is quite painful, and therefore is combined with cocaine (hetol, cocaine muriat. āā 0.1:10 water). For instillation in serous and seroplastic iritis, one drop of a 2 to 5 per cent sol. in 0.5 NaCl sol. with 1 per cent novocaine is used every two days after previous cocainization. The number of drops should be increased after the remedy has been used for some time.

Histopin salve, see local serotherapy.

Holocaine (diethoxyethenildiphenilamidin hydrochl.) An anesthetic somewhat more irritating than cocaine but has a deeper action, does not dilate the pupil or constrict the vessels. Used in a 1 per cent solution, which has a slight antiseptic action also. Does not stand boiling in glass, and must be boiled in porcelain.

Homatropine hydrobrom., see atropine.

Hydrogen peroxide in 1 to 3 per cent sol., a strong disinfectant. It is broken up by katalase, a ferment found in every cell, into hydrogen and oxygen, which form a white foam and penetrate into the tissues. It is a deodorant, excites the production of granulations, and is used in infectious processes of the cornea and conjunctiva, and for washing the conjunctiva before operation.

Ortizon stable compound of 36 parts of hydrogen peroxide with 64 parts of carbamid. Withstands atmospheric changes. Is used in 3 per cent sol. in chronic catarrh of the conjunctiva, blennorrhea and ulcers of the cornea. It is very useful in treating fistulæ and wound canals, melting on the wound surface with the evolution of oxygen.

Perhydrol, 30 per cent sol. hydrogen peroxide, diluted 10 to 30 times for lavage in purulent conjunctivitis, before operation, in infections, for cleansing the lids of crusts and scales. It is used in ulcus serp. and lacrimal sac suppuration also.

Perhydrit, also a permanent hydrogen peroxide compound, containing 34 to 36 parts. One 3 gm. tablet in 100 gms. water=1 per cent sol. Used like the above.

Hydrargyrum. The different preparations are used in solutions, salves or powders.

Hydrar. bichl. corrosiv.=sublimate, in solutions of 1:5000-10000, is used for washing out the conjunctival sac and for compresses. Stronger solutions irritate. It is also used for sterilizing eye drops. A solution of 0.2 pro mil. is used for grattage of the conjunctiva in trachoma. A salve of 1:5000 is used for disinfecting the conjunctival sac

in ulcerative corneal conditions, sometimes combined with atropine (atropine 0.1, sublimate 0.003, vaseline 10). A few drops of a 1:3-5000 sol. injected into a cysticercus vesicle kills the worm.

Sublamin does not immediately cause precipitation of albumin nor is it irritative to the tissues. Solutions of 1:3-5000 are used to wash out the conjunctival sac and for eye drops. Salve, 0.005-0.02:10 vaselin.

Hg. oxycyan., 1:4-5000 is used in the same way, also for subconjunctival injections, which are quite painful, and therefore should be preceded by an injection of 1 to 2 degrees of a 1 per cent acoin sol. It has been recommended as especially valuable in central myopic choroiditis (Senn). In blepharitis squamosa, 1/50 per cent, with massage of the conjunctiva at the same time. Hg. oxycyan., 0.0025 to 10 water with the addition of a few drops of acid. acet. dilut. is used for the itching in vernal conjunctivitis.

Hg. oxid. flav. via humida parat. or in powder is used in the form of the yellow salve, 1 to 2½ per cent with equal parts of vaseline and lanolin, or according to Schweissinger-Schanz, in blepharitis cil., phlyctenules, and for clearing up corneal opacities, in the latter case with the addition of 2 to 3 per cent dionin. It is somewhat irritative, therefore it should be massaged in, and the remainder washed out. Sensitive skins do not stand it well as a lid salve, in which case the following is better to use.

Hg. precip. alb., 1 per cent salve.

Hg. chlor. mite=calomel. Used in phlyctenules and corneal opacities. It should not be used when the patient is taking iodine internally.

Asterol in solutions of 1:3-5000 is used for disinfecting instruments and eye water. It is advised for subconjunctival injections in corneal ulcers of all kinds (care must be taken when the iris is involved or there is increase of tension), severe scleritis, chronic iridocyclitis and most of the diseases of the macula, especially myopic. The injec-

tions are said to be almost painless and cause no adhesions (asterol 0.001, dionin 0.025, NaCl 0.02, aquae 10.0).

Ichtalbin, see ichthyol.

Ichthargan (silver ichthyolsulf., containing 30 per cent silver), see argent.

Ichthyol, ammon. sulphoichthyol, a bituminous sulphur preparation containing 10 per cent sulphur. In 5 per cent solution, it is used for washing out the conjunctival sac before operations and for compresses. In trachoma, the 50 per cent solution is used first for painting the conjunctiva, and after eight days the pure ichthyol. It is used pure in erysipelas, not too thickly applied and a good 1 cm. upon the healthy skin, being covered then with cotton. Usually the first application cures, but if the disease extends, the new areas should be covered.

In salve form, alone or combined with zinc oxide (ichthyol 0.15-0.2, zinc oxide 1.0, vaseline 10.0), it is used in conjunctivitis and blepharitis. Peters praised it in chronic conjunctivitis, and for massaging the conjunctiva and cornea in rosacea disease. In the treatment of eczema of the face of scrofulous children, Unna's zinc-ichthyol salve mull is wonderful.

Itrol, see argent.

Iodine and its preparations.

Tinct. iodine for painting the lid margins in blepharitis ulcerosa. In herpetic keratitis and recurrent corneal erosion, after removal of the epithelium, it is painted upon the denuded area (see mechanical therapy). The lid is painted with it before operations. In dacryocystitis, it may be injected into the lacrimal sac.

Kal. and *natr. iodide* are used as eye baths in beginning cataract (2½ to 5 per cent), also as drops and subconjunctival injections for the same purpose. Badal uses potas. and sod. iodide as drops in increasing strengths from 2½ to 20 per cent, and also as eye water. Verderame and v. Pflugk obtained results from injections of 2½ to 5 per cent sol.; Kaz used 5 to 10 per cent sol. as drops; Walter used

a 33 1/3 per cent salve, later rubbed iothion in amounts of half a pea into the forehead and temple, and combined this with the drops and washings of Badal. Meyer-Steinegg used ½ per cent sol. sod. iodide with ½ per cent sol. dionin once daily, combined with a drop of 2 per cent dionin every eight to ten days. Subconjunctival injection of 1 c.c. of a 2 to 3 per cent sol. are made in choroidal disease, and 3 to 5 per cent salve is used in parenchymatous keratitis for clearing up the opacities.

Iodipin (solution in sesame oil) is injected under the conjunctiva in tuberculous processes of the uvea, 0.025:10, with 2.5 per cent cocaine and 1 to 5 per cent hetol solution, also 0.01 to 0.03 of a 10 per cent sol. every eight days in scleritis, sclerosing keratitis and vitreal opacities accompanying choroiditis. It leaves a brownish-violet spot which gradually turns to brown, then yellow and finally disappears.

*Iodoform** is used as a powder in wounds of the lid and conjunctiva, also in lupus and tuberculous disease of the latter or of the eyeball. It is used in intraocular disinfection in hypopyon and purulent processes in the vitreous by introducing rods of the material (the results have been vigorously denied).

Aristol (diioddithymol), externally as a powder like iodoform. *Aristol oil,* sterile in ampoules, is used in burns and lime burns of the conjunctiva and cornea.

Europhen, an odorless powder, for dusting over wound surfaces.

Iodosolvin, an emulsion containing 15 per cent iodine, and *iodovasogen* for external inunctions in cataract.

Novoiodin, a combination of iodine with formaldehyde, a powder, 1:10 sugar, is rubbed on ulcus serpens with a rod, and is also used in phlyctenulae and dacryocystitis,

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* The translator has had great success in corneal ulcers from the use of a salve of iodoform 1.0, atropine sulph. 0.2, vaseline alb. 10.0, a small amount inserted daily into the conjunctival sac.

and is introduced into the anterior chamber when panophthalmia threatens.

Jequirity, the seed of abrus precator, from which are formed jequiritol and jequiritol serum (see local serotherapy).

Jequiritol is used externally in epithelioma of the lid.

Kalium chlor. with sod. bibor. is used as an eye bath (0.6 per cent kal. chlor. to 1 per cent sod. bicarb. sol.).

Kali chlorat., in chronic conjunctivitis, 0.3 to 10 drops, several times a day, also as eye bath.

Kali permangan., 1:5000, for compresses and lavage, and for flushing in gonoblennorrhea neon. and adult., the first day three times, later twice, until the secretion stops, irrigating meanwhile with the same solution.

Carbonic acid snow. The gas is allowed to escape from the container into a sack, and from the masses formed a rod is made with which the area is touched for some seconds. It is suitable for the treatment of superficial telangiectases, warts and xanthelasma. The white membrane which forms sloughs off in twenty-four hours. It is recommended in rodent ulcer of the cornea and scleritis, also.

Katharol, 3 per cent sol. hydrogen peroxide, is used for compresses and for softening crusts when the lids are stuck together.

Laneps, a salve base formed from hydrocarbons.

Lanolin anhydr., wool fat, salve base, also with equal parts of vaseline.

Lenicet, see alum.

Mattan is at the same time a cooling salve and a protecting powder, a reflectless covering paste with a drying action, used in weeping eczema, seborrhea, sensitive skin, and against wet and cold. It can be colored like the skin and so make an inconspicuous cover for it, without a fatty look. In combination with zinc and ichthyol, it is used for blepharitis cil.

Mastisol, a solution of mastix in a special solvent, is used

as a dressing for securing light dressings and covering small lid wounds.

Menthol, used as menthol-camphor-paraffin spray in the nose, is said to ameliorate the severity of the hay fever attack.

Menth. piper., some drops of ol. menth. pip. are added to eye baths.

Methylatropin hydrobrom., see atropine.

Methylene blue, see pyoktanin.

Mitin, salve base, light rose color, used as a cosmetic, scarcely visible on the skin.

Miotics, see arecolin, eserine, physostigmine, pilocarpin.

Mydriatics, see atropine, daturin, duboisin methalatropine, mydrin, scopolamin.

Mydrin, see atropine.

Naphthalan for blepharitis in 1 per cent salve, also with 2 per cent cocaine in vernal conjunctivitis.

Naphthol 10.0, sulph. precip. 50.0, sapo kalin. and lanolin aa 25.0, is used in stubborn eczema of the lids. After one-half to one hour, it is to be washed off.

Natr. bibor., see acid. bor.

Natr. bicarb. 1½ per cent, as addition to eye baths.

Natr. carb. with natr. bibor. and natr. chlor., aa 1.0:200.0, eye bath.

Natr. chlor., 0.6 per cent as eye bath, also in combination with natr. bicarb. In sol., 2, 3, 10, 20 per cent it is used as subconjunctival injections in numerous diseases (keratitis, uveitis, vitreal opacities, detachment of the retina, etc.). Additions of ½ per cent acoin and 2 per cent cocaine make the injections less painful. Novocaine is still better.

Novocaine, see cocaine.

Novoiodine, see iodine.

Ol. fagi s. rusci, in blepharitis squamosa with ol. oliv. aa 10.0.

Ol. foeniculi, a few drops are added to eye baths.

Ol. menth. piperit., used for the same purpose as the foregoing.

Opium and preparations.

Extract. opii, used as a salve (0.25:10.0) to be rubbed into the forehead in painful ocular affections. *Tinct. op. croc.,* is added to zinc solutions in chronic catarrh (Tinct op. croc. 0.3 to 0.5, zinc. sulf., 0.02, aqua. 10.0), and is used in old corneal opacities also.

Morphine, an alkaloid of opium, is sometimes used in 1 per cent sol. in scrof. blepharospasm.

Dionin, ethylmorphine hydrochlor. Its lymphagogic action was discovered by Wolffberg. When it is instilled, it causes slight burning, chemosis of the conjunctiva and swelling of the lid. It is used in 2 to 5 per cent sol. The chemotic action is lost after repeated instillations, but reappears after it has been discontinued for a few days. In addition, it stops pain, and is used for that purpose as a 2 to 4 per cent addition to atropine solutions in painful disease of the anterior uvea. It is used with advantage, also, in parenchymatous keratitis, episcleritis, vitreal opacities, and old corneal opacities. In the latter, it is used in combination with yellow ointment (Hg. oxid. flav. pult. 0.1, dionin 0.2, vaseline 10). It can also be used in the form of the pure powder or the discs in the conjunctival sac. Subconjunctival injections are recommended in myopia with intraocular complications, for aiding the absorption of lens matter and vitreal opacities, and to alleviate the pain in absolute glaucoma. From ½ to 1 c.c. of a 3 per cent sol. twice a week, adding a degree of 1 per cent acoin sol. for each c.c. of the sol. to ameliorate the pain.

Optochin, see chinin.

Orzimet, see alum.

Orthoform (p-amido-m-oxybenzoic acid methylester), used as 5 to 10 per cent salve in herpetic keratitis, recurring corneal erosion, burns and injuries of the cornea. Absolutely nontoxic, and has an anesthetic action.

Ortizon, fixed hydrogen peroxide preparation, q. v.

Paraffin, liquid or solid, both used for making salves, and

in forming a better stump after enucleation and exenteration of the eyeball.

Pellidol, see scarlet red.

Perhydrol, see hydrogen peroxide.

Perhydrit, ibid.

Peru oil. In septic ulcers and keratitis dendr. and eczem., the diseased places are touched with a cotton pledget.

Physostigmin or **eserine** sulph. and salicyl., an alkaloid of the calabar bean. The salicylate is more stable than the other salt. They cause contraction of the pupil, increase of accommodation, and decrease of tension. Long use is followed by follicular catarrh, so that the salve is better. It is indicated wherever decrease of tension is desired, especially in acute and chronic glaucoma, either alone or in combination with pilocarpin, cocaine or dionin. It is used pure in ½ to 1 per cent sol.; or phys. 0.02, pilocarp. muriat. 0.05, aquae ad 10.0; or phys. 0.02, pilocarp. 0.2, cocaine 0.05, aquae 10.0; or as a 1 per cent salve.

Physostol-Riedel, 1 per cent sterilized sol. of physostig. puriss. in absolutely anhydrous olive oil, and as discs are very active forms.

Pilocarpin. hydrochlor., alkaloid from jaborandi leaves, has a similar action to physostig., but is weaker, and is more suitable for longer use. In 1-2 per cent sol., it has the same indications as physostigmin.

Plumb. acet., is added to salves, 0.1-.02, zinc oxide 1.0, vaselin 10.0. *Liq. pb. subacet.,* 5 to 6 drops in a glass of water for compresses. Great care must be taken when this is used because of the danger of lead deposits in the cornea.

Pollantin, dried pulverized serum, to be dusted into the eye or nose in hay fever; as fluid serum, one drop in the eye and 1 to 2 drops in each nostril.

Protargol, see argent.

Pyocyanase, a mixture of bactericidal substances and nucleoses with a pure culture of B. pyocyaneus. It is furnished sterile, for disinfecting the conjunctival sac.

Pyoktanin, an aniline dye, yellow or blue, P. aureum and caerul., used in a solution of 1:100 in disease of the conjunctival sac, blennorrhea and sympathetic ophthalmia, to be instilled q. 2 h. Comes in the form of pyoktanin pencil also. Is now rarely used.

Pyraloxin, astringent in catarrh of the conjunctiva, 0.02, suprarenin 0.5, aquae bor. (3 per cent) 10.0, aq. foenic. ad 20.0. As a salve, 0.1-0.5, aq. bor. (3 per cent) 20.0, suprarenin 1.0, eucerin anhydr. ad 50.0, in blepharitis cil.

Resorcin, a dioxybenzol combination, ½ per cent sol. in conjunctival catarrh; as ¼-½ salve in seborrhea of the lids.

Rhinovalin, solution of validol in liquid paraffin, for colds, 1 c.c. three times a day to be dropped into the nostrils and retained with cotton.

Rivanil, quinine derivative, ¼ per cent sol. q. 1 hr. in acute catarrh of the conjunctiva, see quinine.

Scarlet-Red-Biebrich, as a 2 per cent salve in wounds that are not granulating properly. In recurrent corneal erosions, a large amount is inserted into the conjunctival sac, and covered with a bandage.

Pellidol, a less staining substitute for the preceding, used in the same way and with the same indications. However, it is not so potent in recurrent corneal erosions. It is used in phlyctenules and blepharitis, also.

Scopolamine hydrobrom., alkaloid of scopolia atrop. used in sol. 0.01-0.02:10.0, under the same indications as atropine, but is more toxic than it.

Scopomorphine, a mixture of scopolamine and morphine, used for narcosis.

Sophol, see argent.

Spirit. camphor., 4.0, spir. lavandul. 3.0, spir. nitros. dulc. 0.25, spir. vini rect. 120.0, ol. melis. gtts. 5, ol. rosar. gtts. 4; Pagenstecher's Spirits, used for washings.

Stovaine, 5 to 10 per cent sol. for anesthesia, see cocaine.

Strychnin. nitr., alkaloid found in combination with

brucin. It is injected subcutaneously in the temples in optic nerve disease, 0.002-0.005.

Sublamin, see Hg.

Sublimat., ibid.

Suprarenal preparations cause constriction of the superficial vessels of the conjunctiva, also anemia of the upper skin layer. In severe hyperemia of the conjunctiva, they are to be used before cocainizing. The best and most stable form is the synthetic *suprarenin hydrochl.* (Höchst), furnished in solution of 1:1000. It may be added to zinc solutions. In hay fever, it has a palliative action in connection with cocaine (cocaine 0.05 to 0.1, suprarenin 2.5 to 5.0, 0.6 per cent sol. sod. chlor. ad 10.0).

Older preparations are *atrabilin,* probably the first adrenal preparation, *adrenalin* (Takamine), *epinephrin,* etc., but in Germany these are overshadowed by the Höchst product.

Unna used suprarenin as an addition to boric acid salve on account of its anemic action on the skin. If it is continued too long, suprarenin can cause vasomotor paralysis of the conjunctival vessels.

Syrgol, see argent.

Tannin, astringent, in 1 to 2 per cent sol. in conjunctivitis.

Thiosinamin, 4 to 5 per cent sol., 0.5 c.c. subconjunctivally in leucoma corn. (Thiosinamin 1.0, aq. 20.0, glycerin 4.0).

Tinct. iodine, see iodine.

Tropacocaine hydrochlor., 2 to 3 per cent sol., less toxic but also less potent as an anesthetic than cocain, q. v.

Trypaflavin, salt of one of the dyes of the akridin series. It is a disinfectant and is recommended in purulent conjunctivitis, especially gonorrheic, in 1 to 2 per cent sol. Must be kept in the dark.

Tumenol, tar derivative, as a salve in eczema, tum. 0.05, zinc oxide 1.0, vaselin 10.0.

Ungt leniens, (made of cer. alb., cetaceum, ol. amygdal.,

aq., and a little ol. rosar.) a salve base for use with "swell" patients.

Vaselin. alb. and flav., residue from petroleum distillation. A salve base. Nonirritating when pure.

Vucin, see chinin.

Xeroform, see bismuth.

Yohimbin. hydrochlor., ½ to 1 per cent sol., has an anesthetic action but is very irritating.

Zincum oxid., used as a powder in wounds to promote granulations, also in the treatment of weeping eczema. Is used alone or with ichthyol as a salve, see ichthyol.

Zinc. sulph., probably the most frequently used astringent, in 0.1-0.25-0.5 per cent sol.* in all forms of conjunctivitis, also in combination with suprarenin (0.1 to 0.15:10.0). Is specific in diplobacillus inflammation, also in diplobacillus ulcer of the cornea, which must be treated ten or more times. In ¼ per cent sol., it is used for compresses in acute conjunctivitis, before the local treatment is begun. A 20 per cent sol. is used in serp. ulcer of the cornea, every two days for eight days, and longer if necessary. Cocaine must be used first.

Zeozon, aq. zeozon., 0.3 per cent sol. of the orthoxy derivative of aesculin, relieves sensations of dazzling, does not irritate even after long use, and often renders protective glasses unnecessary on high mountains and at the sea. Used pro re nota.

5. Serotherapy

The attempt has been made in many eye diseases to produce a local serotherapy, the first and best example of which is Römer's *jequiritol.* The action of jequiritol and jeq. serum rests on a local inflammation of the tissues caused by *abrin,* a toxalbumin of the jequirity bean. Römer has developed a measurable form, which can be obtained

* It may be used in a 2 per cent solution as eye drops, once daily, by the oculist.—Translator.

under the name of *Jequiritol-Merck,* in four vials of increasing strengths. In the beginning, a small drop of the weakest solution is used, and if no reaction follows, the number of drops is increased by one a day until an initial reaction appears. In old processes, the reaction does not appear until sol. No. 2 is used. The dose of this is increased every four to six days until the desired degree of inflammation is reached. If the action of the jequiritol is too strong, a drop of jequiritol serum is used; and if this is too strong, the serum is injected subcutaneously. The beginning of the reaction is marked by lacrimation and photophobia, which is followed by swelling of the lids, chemosis and fibrinous exudate on the conjunctiva, a glassy appearance of the cornea, and an overfilling of the vessels present. Then come pain and swelling of the preauricular lymph nodes. This picture reaches its climax in twenty-four to thirty-six hours, and decreases in six to eight days. Sometimes the iris takes part in the inflammation, and there may also be disturbances of the body as a whole. In ten to fourteen days, all symptoms have usually disappeared.

The indications for the use of the serum are, first, old trachoma with dense pannus of the cornea, or old corneal opacities. For the treatment, hospital care is absolutely necessary.

Belay has described a local serotherapy for trachoma, where a vaccine is made by scraping the conjunctiva and expressing the follicles, and this is said to be very efficacious when injected subcutaneously. An autovaccine is the best.

A local passive immunization is accomplished by the Wassermann *histopin salve* which is made from living staphylococci, obtained by extraction with water, and which contains the immune bodies of the bacilli. This salve is especially valuable in the treatment of disease of the lid margins with tendency to stye formation.

The use of the *diplobacillus* serum, of which there is an

active and a passive form, has shown no results in diplobacilli disease of the cornea.

Among the local sera we must count powder hay fever sera, *pollantin* and *graminol*. The first is made by treating horses with the pollen toxin, and is not suitable for subcutaneous use on account of its severe irritative action. The dry powder is dusted into the conjunctival sac and the nose. Its action is ameliorative, not curative.

The graminol-hay fever serum—Weichardt is obtained from ruminants at the time that the grasses are in bloom. It is freed from its salts by dialysis, dried in vacuo, and used in the nose in the powder form.

The new *cancer* serum of Deutschmann-Kotzenberg should be included in this list. It is obtained from horses which have been injected with testicular or ovarian cells, in order to cause the animal to develop substances destructive to young cells. Injections of ½ to 2 c.c. are made under the tumor daily or every other day, according to the reaction, but may be given internally also (Laboratorium Ruete-Enoch, Hamburg).

Rohmer has used a local *autoserotherapy* in corneal ulcers, resistant conjunctivitis, iritis and parenchymatous keratitis. He places a vesicator of 4 to 5 c.c. on the side of the arm, and the next day collects the fluid and injects it subconjunctivally. This may be repeated every two days.

Finally, we must mention the experiment of Gilbert, who noted a favorable influence in blennorrhea by the instillation of *simple horse serum.*

6. Electrotherapy

The *galvanic* and the *faradic* currents are often used in the local treatment of eye diseases. Both forms are used in inflammatory and nervous diseases, as well as in paralyses and neuralgias.

In the *galvanic* treatment of the eye and its vicinity, we should not use more than 5.0 ma., and in the *faradic,* not

more than 0.5, while in *electrolysis* we may use up to 20 ma., and in kataphoresis up to 1 ma. In the galvanic or the faradic, the electrodes are the ordinary ones or those of v. Reuss, which are excavated like a shell and have pads of wet cotton between them and the eye. For the direct galvanization of the muscles, there are the small platinum electrodes of Eulenberg.

The *galvanic* current is useful in supra- and infraorbital neuralgia, and in fibrillar twitching of the orbicularis. In the former, the current is led from the exit of the nerves to the occiput for 5 to 15 minutes, strength 3 to 5 ma., anode over the nerve. For the latter, the anode is placed on the closed lids, time three to five minutes, current 3 ma.

In paralysis of the levator palp. sup., the moistened kathode is placed on the closed lids, the anode on the nape or the occiput, and 1 to 3 ma. is passed for one and one-half to three minutes, five minutes at the most, first every day, later less often. In paralysis of other muscles, the kathode is placed on the closed lid at a place corresponding to the muscle to be treated. Eulenberg places his electrodes directly on the paralyzed muscle.

The *faradic* current is used in the same way, the strength depending on the degree of contraction of the orbicularis. The electrodes must always be kept sufficiently moist with water or salt solution.

In general, we can limit electric treatment to paralyses connected with diseases of a hysteric or neurasthenic nature, while for other forms, the treatment must be directed to the etiology. For nervous asthenopia, Fuchs uses electric treatment after he has failed to cure the condition by correcting the refractive and muscular anomalies and by the use of eye douches. His treatment is: each eye five minutes, 1 to 2 ma., kathode on the neck, small round anode on the eye. Previously, the patient should read until he is tired, and should be promised a certain cure.

Galvanization has been recommended in insufficiency of the interni, nystagmus, and paralysis of the pupil and of

the accommodation. The current is sent across the head, from temple to temple.

Of the inflammatory diseases, herpes corneae, neuroparalytic keratitis and other inflammatory conditions of the cornea, iris and ciliary body, scleritis, episcleritis and vitreal opacities should be treated *galvanically* as an adjuvant to other treatment, 2 to 3 ma., kathode on lid. Its analgesic action and amelioration of subjective complaints are especially praised. The latter are said to disappear especially quickly if the current is applied directly to the disease focus after cocainizing the conjunctiva 1 to 1.5 ma., (one to two minutes' duration). The *faradic* current, also, has an analgesic action in the above diseases, either by the method of v. Reuss of three to five minutes' duration, or by the prolonged faradization of one-half hour with a special v. Reuss electrode, which, covered with a thick layer of wet cotton, is applied directly to the eye. The current is weak at first, and is increased until the patient complains of discomfort.

In inflammatory and noninflammatory diseases of the opticus, Mann and Paul obtained improvement in function following strong applications of the *galvanic* current, 10 ma. for one-quarter to one hour. The anode equipped with a moist pad of cotton, is placed on the lid and the kathode on the neck. It has also been used in vitreal hemorrhages. Many cases of episcleritis have been improved by the *electric eye bath,* an apparatus filled with physiologic salt solution, through whose walls the current is conducted by means of a suitable attachment.

The current is more often used in *electrolysis* than in the above cases. It is used in removing misplaced cilia and small tumors of the lids. In the former case, the needle fastened in the handle of the negative pole is inserted along the cilia up to its follicle, and the positive electrode is placed on the neck or held in the hand of the patient. The current is gradually raised to 2 to 5 ma., and is allowed to act for one to two minutes. The appearance of foam at the

point of insertion marks the beginning of its action. After the needle is removed, it must be possible to withdraw the cilia easily and without resistance, or else the procedure has not been correct. As this little operation is somewhat painful, the lid is previously injected with novocaine-suprarenin.

In the electrolytic removal of small angiomata, small warts, xanthelasmata and the like, the needle (positive) is inserted into the base of the tumor and the negative electrode is placed on the neck or in the hand of the patient. Or, both needles can be inserted crosswise through the base of the tumor, and a current of 5 to 10 ma. allowed to flow for 1 to 2 minutes. In deep lying angiomata, where it is usually a case of destroying the vessels, the needles are inserted more or less deeply according to the location and size of the tumor, and the current passed in the same way.

Electrolysis has also been recommended for making strictures of lacrimal passageways permeable, an appropriate probe or needle being inserted into the duct. The treatment should be repeated at intervals of six to eight days. I do not know whether permanent results have been obtained thereby.

Electrolysis has been tried in trachoma, also, and special appliances have been devised for this purpose. However, we can get better results with mechanical means, drugs, caustics or ray treatment.

It has been used in vernal conjunctivitis, also. Every granulation should have four treatments, beginning with 1 to 2 ma. for a few minutes, later increasing to 4 to 5 ma. This is followed by bandaging for a few days. The treatment requires several months.

In the treatment of detachment of the retina by electrolysis, the positive pole needle is inserted through the sclera at the site of the detachment, and a current of ¼ ma. is passed for one minute. The method is not used much.

Iontophoresis consists in introducing the ions of certain drugs into the eye. For this purpose we use Wirtz' instru-

ments for the treatment of the lids, conjunctiva, cornea and episcleral disease. The electrodes vary with the disease to be treated. The zinc, chlorine and iodine ions are the ones usually introduced, the former for the treatment of ulcus serpens, the negative pole on the ulcer, current up to 5 ma., one minute. Similarly, in the treatment of corneal opacities, chlorine and iodine ions are developed at the positive pole. In the treatment of episcleritic foci, chlorine ions are used. All these take up to 5 ma., for one minute. Optochin, 1 per cent sol., has been tried in the treatment of ulcus serp. It is said to penerate the cornea in a few minutes and kill the pneumococci; 2 ma., one to two minutes. For the treatment of this disease, Lubowsky has devised a special needle that has given him better service than Wirtz' appliances. Birkhäuser changed Wirtz' corneal electrode, to prevent injury to the cornea by burning. In iontophoresis, the anesthetic should be alypin and not cocaine. Perhaps iontophoresis will find a wider application in lime burns of the cornea, clearing up of which has been observed by Braun and Haurowitz (ammon. lact. 10 per cent, positive pole on the eye, 2 ma., four to five minutes).

As to the results of iontophoresis, those who have used it in ulcus serpens and herpetic corneal disease are fairly unanimous in its praise, but less so as to its value in corneal opacity. In old opacities after parenchymatous keratitis, which had resisted all other treatment for years, I have seen a distinct improvement. Birkhäuser also praises it in old opacities. Occasionally, I have seen good results in old lesions of the lids.

Finally, *galvanocautery* likewise has its chief indication in ulcus serpens and fascicular keratitis. In the former, the advancing border is to be cauterized; in the latter the head of the bundle of vessels. In the latter, the progress can certainly be checked; the result in extensive ulc. serp. is not so sure. In order to prevent an increase in the conicity in keratoconus, its apex is cauterized in one or more

treatments, in order to obtain a strong scar and a flattening of the cornea. The scar can be tattooed, and an optical iridectomy performed later. In recurrent corneal erosions, it is sometimes necessary to use the cautery, and this is true, also, of conjunctival diseases, especially trachoma, where the individual granules are destroyed by the tip of the cautery. Rosenstein used the cautery in chronic catarrh of the conjunctiva, removing thereby the follicles in the canthi, the fornices and the velvety inequalities on the tarsus. The next week, he painted the surface daily with 1½ per cent silver solution and massaged it with sublimated cotton. The second week, he painted it every second day, and massaged with yellow salve.

Finally, the cautery has been used in the treatment of retinal detachment, with or without previous injection of sublimate (1:5000) or 10 to 20 per cent salt solution. A number of cauterizations are made at the site of the detachment, which, however, do not penetrate the sclera, the idea being to cause an active inflammation at the site of the burns which would lead to adhesions of the retina. The sclera is sometimes punctured, also. Stargardt tries to secure adhesions of the inner tunics by direct cautery of the choroid. He cuts through the sclera in front of the site of the detachment as far as the choroid, and cauterizes this, in order to secure a firm scar between the inner tunics and thus prevent further advance of the detachment. To this is added a puncture of the sclera at the site of the detachment. There are no other reports as to the value of this procedure.

For carrying out all of these methods of treatment, we can recommend the multo- or pantostates of several firms, since they can be attached directly to the electric cords. In iontophoresis and electrolysis, care must be taken that the contact with the positive and negative poles is always made correctly.

PART II
SPECIAL PART

CHAPTER IV

1. Lids

Edema: Noninflammatory: In disease of the kidneys, heart, and angioneurotic edema, recurrent and in connection with edema of other parts of the body (Quinck's edema). Late edema in lues. Treat the cause.

Inflammatory: In inflammation of the lid or its vicinity. Treat the cause.

Hordeola: Hot compresses (salves, vaccine, yeast preparations, arsenic, histopin, raying).

Chalazion: Evacuation, massage with iodine, the subsequent thickening.

Dacryocystitis phlegmon.: Hot compresses, incision, slitting of the canaliculi and expression of the sac.

Furuncle: Incision, hot compresses, ichthyol, formalin, suction.

Periostitis: Incision, treatment of the cause, tuberculosis, lues.

Erysipelas: Ichthyol, ichthyolvasogen, paint with guiacol and tinct. iodine.

Trauma: Insect bites, cooling compresses (boric acid, alum. acet., etc.).

Edema accompanying disease of deeper parts: Conjunctiva, cornea, panophthalmia, orbital phlegmon. Treatment of the cause, q. v.

Inflammations: In exanthemata of the skin (measles, scarlatina, vaccine reaction). Bland salves; 2 to 3 per cent boric acid, 3 to 5 per cent noviform.

Herpes, like herpes labial. in acute diseases: Bland salves.

Herpes zoster: Galvanization, internally aspirin, 1.0 twice daily, morphine internally or hypodermically if necessary. Hydrogen peroxide preparations for the removal of the crusts. Powders or bland salves for the ulcers.

Eczema: General treatment in scrofulous and other diatheses. Irritative therapy. Light treatment. Locally, salves; zinc, 5 to 10 per cent, zinc-ichthyol salve (zinc 5 to 10 per cent, ichth. 1 to 1.5 per cent: vaseline 10.0). Hebra's salve, 1 per cent resorcin or 1 per cent salicyl. salve, alone or with sulphur (sulf. precip. 1.0, acid. salicyl. 0.5, tinct. benz. 0.5, vaseline ad 20.0), tumenol salve (tumen. 0.25, zinc oxid 1.0, vaseline 10.0), 1 to 2 per cent pellidol salve, naphthalan and naphthol salve. Dusting powders, or paint with 2 to 3 per cent silver nitrate sol., or zinc powder. A very efficient remedy is Unna's zinc-ichthyol salve mull, kept on over night with a loose bandage. Douches of hot air.

Blepharitis cil. squam.: Removal of external causes, steam, heat, smoke. Cure of the local cause (catarrh of the conjunctiva, lacrimal apparatus, errors of refraction), as well as general (anemia, scrofulosis, seborrhea) massage, ray therapy. Locally; softening and removal of the scales and crusts, if necessary with a moist dressing, Hg. salve, yellow salve, 1 to 2.5 per cent. This is not well borne by sensitive skins, for which 1 per cent white precipitate salve is better. Noviform salve, 3 to 5 per cent, 10 per cent zinc salve, also in combination with ichthyol, 1 per cent salicylic salve or a dusting mixture of this drug, 1 per cent resorcin salve, 1 to 2 per cent pellidol salve, ointments of bismuth, airol, naphthalan or naphthol; also precip. sulph. 1.0, acid salicyl. 0.5, tinct. benz. 0.5, vaseline ad 20.0. Also, gallic acid, picric acid and tumenol. Where there is a tendency to styes, histopin; internally yeast preparations, vaccine therapy, change of climate.

Blepharitis ulcer: General and local treatment as above.

Touch the ulcers with a medicated probe (see argent.), tinct. iodine, paint with silver, salves as above, epilation affected cilia, iontophoresis.

Trichiasis: Epilation, electrolysis (cocaine injected previously).

Entropion, Spastic, in children: Treat cause.

Senile: Try to correct with collodium or strips of adhesive plaster, otherwise operation.

Cicatricial: Operation.

Ectropion: Spastic: In children with disease of the conjunctiva, treat the underlying condition.

Paralytic: Likewise, operation if unsuccessful.

Senile: Often accompanied by eversion of the inferior punctum lacrimale. Slit lower canaliculus, treat accompanying disease of lid and conjunctiva, wiping away of the tears *upwards,* operation.

Blepharospasm: Cure the cause. Foreign bodies, inflammations, neuralgia of the trifacial, hysteria. Instillation of cocaine (to be done with care), 5 per cent acoin oil (Heydel). In scrofulous inflammations, immersion in cold water, canthotomy. Calcium internally. Instillation of 2 per cent optochin, injection of 2 per cent novocaine into the orbicularis upwards and outwards, starting at the external canthus, irritative therapy. In neuralgias, galvanization or faradization, injection of alcohol, massage of nerve, inhalation of chlorylen. In mild photophobia without special etiology, aq. zeozon sometimes gives good results.

Lagoppthalmus: Treat cause, paralysis of the orbicularis; galvanization or faradization, Basedow's disease or tumor. As a last resort, suturing of the palpebral orifice or tarsorrhapy. Watch out for keratitis e lagoph., use boric acid salve.

Cicatricial lagophthalmus: Try fibrolysin, operation.

Ptosis congenita: Operation.

Acquired: Treatment of the cause, electricity, ptosis spectacles (metal attachment to the frame that pushes the upper lid back), operation.

Hordeola: Hot compresses, treatment of any lid disease, salves (v. s.). Histopin salve, yeast preparations, light therapy, vaccine, suction.

Chalazia: Small, beginning ones can sometimes be cured by massage, otherwise they must be evacuated. The thickening that remains should be massaged with iodin, salve or iodovasogen.

Furuncles and lid abscesses: Surgical treatment, suction.

Lime infarct: Scrape out.

Pediculi: Grey mercury ointment.

Lid gangrene: Trauma, infectious diseases, anthrax, diphtheria. Treat cause, also use serotherapy.

Ulcers: Vaccinia, bland salves, boric acid or pellidol salve.

Tuberculous ulcers: General treatment; locally, iodoform, xeroform, light and ray therapy, paint with lactic acid.

Syphilis: Iodine internally, sublimate or sublamin compresses. Primary lesion rare, and requires specific treatment.

Sporotrichosis: Rare, iodine internally.

Leprosy: Cauterization of the nodules, general treatment.

Tumors: Molluscum contag.: Excision, cauterize wound surfaces.

Xanthelasma: Electrolysis, caustics, cauterize with trichloracetic acid, excision with suture of defect, carbonic acid snow in small ones.

Cysts: Operative removal.

Lymphomata: Determination of the cause (leucemia, tuberculosis, etc.), operative removal, electrolysis and raying.

Lymphangiomata: Electrolysis (negative pole inserted into the tumor), raying, operation.

Angiomata: Same treatment, carbonic acid snow in small ones.

Telangiectasis: Electrolysis (needle inserted through the overlying tissue, 15 to 20 ma., twenty to sixty seconds, repeat in fourteen days if necessary), galvanocautery, carbonic acid snow, raying.

Dermoids, neuromata, sarcomata: Operation, afterwards raying.

Carcinomata: Raying in small ones, which helps in large ones also. Injections of tumorcidin, daily or every other day, 1 c.c. under the tumor. This may be given internally, also (Laboratorium Ruete-Enoch, Hamburg). In small epitheliomata, carbonic acid snow and jequiritol have been used. Operation, which should not be too long deferred, when the lesion is an extensive ulcer where improvement does not soon take place under other forms of treatment.

Epicanthus: Operation.

Blepharophimosis: Treatment of the cause (chronic conjunctivitis), operation.

Ankylo- and *symblepharon:* Operation, fibrolysin to soften the scar.

Keloids after operations: Raying.

2. Conjunctiva

Look for an accompanying lesion of the lacrimal sac, especially in unilateral conditions. The nose should also be examined. Search for chemical and physical agents, smoke, dust, irritating vapors, foreign bodies, dazzling lights, hay fever in summer, etc. When possible, examine the secretion, which is of importance in the treatment. Atmospheric changes.

Conjunctivitis catarrhalis: In acute cases with much irritation, first cooling compresses, 2 to 3 per cent boric acid, ¼ per cent zinc, ¼ per cent alumin. acet., 1:10000 sublimate, 1:5000 sublamin or asterol, 1:5000 hg. cyan., potas. permanganate in the same strength (stains the

skin), 10 drops of alsol in ¼ liter of water. It is better to avoid lead solutions on account of the danger of corneal deposits. Vaseline or boric vaseline applied to the lids in the evening to prevent their sticking together, but no bandage. Hydrogen peroxide and its preparations are very useful in removing crusts and scales. Tell the patient of the danger of infecting others. Burn all cotton, etc., used. Caution against using the same wash basin and towels as other people. Avoid irritation when the cause is chemical or physical.

When there is much secretion, paint with 1-1½ silver nitrate, followed by lavage, not repeating the application until the eschar is cast off. Instead of silver, colloidal salts may be used: protargol 2 to 5 per cent, always to be used freshly prepared and cool; 5 to 10 per cent sophol, 5 per cent syrgol; zinc, 0.015-0.025-0.03:10.0, to which may be added suprarenin 5-20 drops to aq. 10; 6 per cent ormizet, ¼ per cent rivanol; kalii chlor., 0.3:10; cadmium sulph. (obsolete). The salves are: zinc sulph. ichthyol ammon., 0.03:0.1:10, instead of zinc sulph., zinc oxide may be used. In diplobacillus conjunctivitis, zinc sulph. is especially indicated, with the Greifswald mixed stains (see medical treatment) for the first few days. Rhagades at the canthi are painted with silver nitrate, or the patient is given a salve of 3 per cent silver or 10 per cent zinc oxide.

Chronic conjunctivitis: Search for external causes, atmospheric changes, nonclosure of the lids in sleep, malposition of the cilia, eversion of the puncta, skin eruptions (rosacea!), disturbances of the lacrimal apparatus, disturbances of refraction or accommodation, gout.

Locally, zinc sulph., ¼ to 1/3 per cent, either alone or with the addition of suprarenin, 1.0-1.5:10.0 water (suprarenin should not be used too long on account of the danger of relaxation later of the vessels. For the same reason, the addition of cocaine or novocaine is not advisable, especially since cocaine injures the epithelium of the cornea). Collyr. astr. lut. (ammon. chlor. 0.5, zinc sulph.

1.5, aq. 200, add camphor 0.4 dissolved in spir. vini dilut. 20.0, croci 0.1., digest for twenty-four hours, stirring frequently, filter) dilute with water 1-3:10, use for washing one to two times a day; ¼ % pyraloxin, tannin (natr. tetrabor. 2.0, acid tannic 0.3-0.5, aq. ad 50.0, filter, instill morning and evenings), ½ per cent resorcin. The salves are 3 to 5 per cent noviform, 3 per cent boric, orziment, kalii chlor., zinc and opium, pyoktanin.

Good results are obtained often by eye baths with borax or Ems salt solutions, lavage with kalii chlor. and sodii chlor., 0.6 per cent sol., scraping according to Peters' method, massage (see mechanical therapy), and zinc with opium (0.025.0:0.5 tinct. opii croc.:aq. 10.0).

When follicles are present, alum pencil, massage with sublimate, Knapp's roller forceps and Kuhnt's expressor. Diathermia in gouty and rheumatic conjunctivitis. For burning and pain, eye baths and cooling compresses.

Gonoblennorrhea neonat. and *adult.:* Do not cauterize so long as there is a yellow serous or sanguineous discharge. At this time, lavage with 3 per cent boric sol. or 1:5000 potas. permang. or Hg. cyan. sol. Do not paint until the purulent discharge appears, then use silver nitrate, 1 to 1½ per cent, washing afterwards with water. As an aid to this, 5 per cent protargol or sophol. Syrgol is especially active in 5 to 10 per cent sol. After removal of the secretion, blenolenicet salve q. 2. hr., later less often, is not sufficient by itself; ¼ to ½ per cent sol. choleval; 1 to 2 per cent trypaflavin. Serum locally.

No bandage; cold or ice water compresses, but these must be used with care, especially where there is a tendency towards involvement of the cornea. Look for blennorrhea of the lacrimal sac.

Another valuable treatment is irritative therapy (injections of milk, q. v.) especially in corneal complications and blen. adult. In the latter, arthigon may be given intravenously.

Children are placed on the diseased side to prevent

infection of the healthy eye. In adults, this is protected by a watch crystal.

Instead of painting with silver, the weaker solutions, ¼ per cent, may be used as drops.

The silver nitrate treatment, which dates from v. Graefe, is probably the one most generally used, but there are many newer ones which have their advocates.

For example, large amounts of airol are dusted on the everted lid, which are converted by the conjunctival fluid into a thick puree, whereupon the lid is released. This treatment is performed once a day and can be carried out ambulatoric. Airol salve has not the same effect. Animal charcoal, also, has been tried, care being taken that it be introduced properly into the fornices, followed by thorough lavage with kali permang.

In gonoblennorrhea adult., Koffler curettes the thickened conjunctiva and afterwards paints the wound surfaces with tinct. iodine. The lids must be separated at regular intervals.

The important thing in blennorrhea neon. is the prophylaxis. If the genital canal is diseased, immediately after delivery there should be dropped into the eyes of the baby a drop of 2 per cent silver nitrate, or 1 per cent silver acetate, or protargol, sophol or syrgol, the latter of which is said to be specially good. Patients with gonorrhea of the urethra should be told of the danger to the eyes and how to protect them.

Conjunctivitis pseudomembran. and *diphtherit.:* Examine for diphtheria bacilli and streptococci. If there is suspicion of diphtheria, do not wait for the result of the bacteriologic investigation, but rather inject diphtheria serum at once (3000-5000 I. E.), combined with local drops of the serum. Corneal lesions are not contraindications, but are not influenced by the serum. Lukewarm compresses, noncauterizing disinfection, bland salves. Paint the membrane with lemon juice or pyocyanase. Wolfring massages with yellow ointment. Protect the other eye with

a watch crystal. If the examination shows streptococci, try streptococcic serum.

Trachoma: Recent cases with discharge are first cooled and lavaged. Later they are painted with silver nitrate. After amelioration of the early symptoms, expression with Kuhnt's expressor or Knapp's roller forceps, after injection of suprarenin-adrenalin. Grattage with sublimate according to Keinig with a cotton wrapped glass rod, or according to other methods (see massage). Later, copper pencil or alum pencil, 5 per cent copper citrate salve, cusylol, massage with a glass ball. Radium, x-rays, quartz light, Finsen light, iontophoresis. Incision of the individual follicles and expression, also galvanocautery. Brush with a wire brush. Carbonic acid snow. Electrolysis, diathermia, 50 per cent ichthyol sol. Jequirity in dense pannus. Sequelae operated.

Conjunctivitis vernal.: No irritating remedies, residence in high altitudes, exclusion of the air by means of a watch crystal, auto goggles and similar glasses. Euphos or Hallau glass for photophobia.

For the itching, instill acid. acet., or cocaine and adrenalin, 0.02:2.0:10 physiologic salt sol., acoin oil, dionin, potas. chlor., all in weak solutions. Hg. oxycyan., 0.0025:10, naphthalan-cocaine sol., massage with yellow salve or zinc-ichthyol, excise the granulations. In the corneal form, massage with salicylic salve is said to be very efficacious. Electrolysis, diathermia. Internally, arsenic and iron. Ray therapy seems the best treatment. Lately, afenil intravenously has been tried.

Hay fever conjunctivitis: Prophylaxis (Helgoland, North Sea baths).

Locally, cocaine-adrenalin mitigates the complaints (see conj. vern.). Anesthesin with cocaine, optochin (see medical therapy). Pollantin or graminol. Menthol-camphor nose spray. Afenil intravenously has been tried here, also, and calcium taken internally for a long time has been highly praised.

Conjunctivitis phlyctenul.: The general treatment is very important; nutrition, care of the skin, sea or sea salt baths, cod liver oil internally, alone or combined with iodine and iron, calcium preparations. Tuberculin treatment may help. Protein body therapy, light and ray therapy. Locally, massage with yellow salve (when the eye is not too much irritated), calomel (no iodine internally then). Treatment of any lid disease, lice. If the secretion is profuse, silver, noviform or pellidol salve. Paint rhagades with silver. Immersion for photophobia, also try optochin. Injection of novocaine into the orbicularis. Inhalation of chlorylen. Dark glasses. Take care of the nose and throat. Protein body therapy (injection of milk) has sometimes been efficacious in photophobia.

Tuberculosis: Cauterization daily or at intervals with pure or 50 per cent lactic acid followed by lavage, iodoform powder. Finsen light, x-rays, radium. General treatment, q. v.

Parinaud's conjunctivitis: Resembles tuberculosis, usually heals under expectant treatment; otherwise as tuberculosis.

Lupus of the conjunctiva: Treatment similar to tuberculosis.

Syphilis: General treatment.

Pinguecula: Excise if desired.

Amyloid: Excision.

Concretions: Curette.

Xerosis: With hemeralopia, cod liver oil, plenty of fats in the food (vitamins). If keratomalacia is present, improve the nourishment, milk diet. Bland salves for the dryness. In cicatricial trachoma, decrease the size of the palpebral orifice.

Symblepharon: Try fibrolysin, operation.

Hemorrhage: Compresses. When the ocular conjunctiva is involved, injection of salt solution recommended.

Tumors: Operative removal, electrolysis, ray therapy.

3. Lacrimal Apparatus

Dacryoadenitis: Look for the cause (lues, tuberculosis, leucemia, pseudoleucemia, Mikulicz). Appropriate general treatment. Hot compresses, iodine or mercury salves, incise if necessary. X-rays may be tried.

Dacryocystitis phlegmon.: Hot compresses, incision. Streptococcus serum. Slit the lower canaliculus, introduce a probe to the nasal end of the sac, and express the pus (ether).

Dacryocystitis chron.: Examination of the nose and sinuses. Test the permeability of the tear passages, springing, instillation of fluorescein. In children, the cause is often tuberculosis. Incision of the stricture, probing, massage of the sac; syringing with protargol, Hg. oxycyan., zinc solution, ormizet, novoiodin, and hydrogen peroxide preparations. Inject tinct. iodine into the sac (Wessley). Fill the sac several times a week with 1 c.c. 2 per cent resorcin salve. Insert a silk thread through the sac into the nose and allow it to remain. Electrolytic treatment of the stricture. If regular treatment is not possible, remove the tear sac, following, if necessary, with removal of the palpebral lacrimal gland or raying.

Instillation of fibrolysin or its injection into the nasal meati has been recommended (see local medical treatment).

Introduction of a grooved probe with silver or 1 per cent resorcin salve.

In congenital dacryocystitis, expression of the sac is usually sufficient, but it may be necessary to probe.

Epiphora: So far as it is not caused by inflammation, cure the cause, eversion of the inf. punctum lac., etc. Slit the lower canaliculus. In stenosis of the lacrimal passageways, dilate it by probing. Look for foreign bodies (leptothrix) in the canaliculi or sac. It may be necessary to extirpate the lacrimal gland or ray it.

Fistulae: Cauterize with silver nitrate stick, introduc-

tion of ortizon stick, galvanocautery, operation if necessary.

4. Cornea

Erosion: Test with fluorescein, look for foreign body on the cornea or conjunctiva. Acoin oil, atropine, bandage. In recurrent erosion, instillation of 3 to 4 per cent dionin in the evening. One per cent scarlet red ointment in large amounts, with bandage. Abrasion followed by painting with undiluted aq. chlor., tinct. iodine or 10 per cent hydrogen peroxide. Caustics. Atropine. Bandage for eight days.

Herpes febrilis; keratitis dendritica, ker. filiment.: Atropine, curette with a sharp spoon, paint with tinct. iodine, cautery, cauterize with lactic acid, touch with oil of Peru. Orthoform, dermatol or noviform salve. Iontophoresis; subconjunctival injection of hetol. Galvanization. Light and ray therapy. Inhalation of chlorylen.

Herpes zoster: Pay attention to the intraocular tension. Atropine or eserin. Dionin, acoin oil, morphine, galvanization, diathermia.

Keratitis vesicul. and *bullosa:* In blind eyes, dionin, acoin oil, anesthetic salves, hot compresses, enucleation if necessary.

Keratitis neuroparalytica and *e lagophthalmo:* Bland salves, acoin oil, bandage, suture the lids together, galvanization.

Pannus corn. eczemat.: Treat the underlying cause.

Pannus trachom.: See trachoma and ray therapy.

Ulcera corn: In general, guard against infection, bandage, moist compresses (alum. acet., boric sol., etc.). Examine the tear sac. If painful, 2 per cent noviform or xeroform salve, or, better, 10 per cent orthoform salve, which has an anesthetic action. Treat any conjunctival lesion present. Hot poultices, dionin salve or drops, atropine (care in old people and threatening perforation). Torpid forms often improve quicker under quartz light or

x-rays. In the stage of cicatrization, yellow salve, dionin. If there is a dense central opacity, later iridectomy, tattooing. The latter may be done in slight opacities, with or without iridectomy, for improving the sight. Operation of resulting fistulae.*

Ulcus serp.: Examine the tear sac. Atropine, bandage, rest in bed. Local disinfection. Sublimat, noviform, xeroform, dermatol, novoiodine and iodoform salves. In pneumococcus ulcers, 2 per cent optochin, wash out every two hours; touch the ulcer once a day after previous cocainization; also, as a salve used five to six times a day. Touch with a 20 per cent zinc sol., acid. carbol. lique., oil of Peru, balsam of Peru, picric acid or tincture of iodine. Steam cauterization, galvanocauterization, iontophoresis, Saemisch section. Light and ray therapy. Serum therapy.

Diplobacillus ulcer, drop ½ per cent zinc sol. several times a day upon the ulcer. Iontophoresis.

Ulcus catarr.: Treat the catarrh with silver or zinc, atropine, no bandage.

Ulcus eczem.: See also conj. phlycten. General treatment, tuberculin, irritative therapy, diet, climate, sun, sea baths, care of the skin. Look for lice. Internally, cod liver oil, with or without creosote, iodide of iron. Locally, light and ray therapy; noviform, dermatol, xeroform, novoiodine salves; touch the ulcers with oil of Peru. Yellow salve after the irritative symptoms have lessened. Where there are bundles of vessels, cauterize the advancing infiltrate, touch with oil of Peru, treat lids. Immersion for photophobia. One per cent optochin salve. Canthotomy. Avoid cocaine as much as possible. Chlorylen.

Ulcus rodens: Touch with oil of Peru, carbonic acid snow, tincture of iodine, hydrogen peroxide, caustics; iontophoresis, Kuhnt's transplantation. Ray therapy. Tuberculin.

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* Good results in corneal ulcers by the use of the following salve: atropine sulph. 0.2, iodoform 1.0, vaseline alb. 10.0.—Translator.

Rosacea ulcer: Massage with zinc-ichthyol salve, atropine. Tincture of iodine, caustics, radium. Yeast preparations to prevent recurrences, taken internally for a long time.

Keratitis parenchym: Wassermann reaction and diagnostic tuberculin. Treatment of cause, usually mercury rubs, combined with salvarsan or tuberculin. Atropine, dionin, hot compresses. Hetol subconjunctivally in tuberculosis. Treatment of the subsequent opacities with yellow or grey salve, potassium iodide salve, iontophoresis. Irritative therapy and ray therapy should be tried. After cure: iodine and sulphur waters, Tölz, Aachen, Nenndorf, etc. (see baths).

Keratitis sclerot. and *discif.:* Treat the cause: tuberculosis, gout, lues. Locally: atropine, salt injections, iodipin subconjunctivally, dionin, electricity and electrical eye baths. Afenil intravenously.

Keratomalacia: Usually combined with xerosis conjunctivae. Locally: xeroform or noviform salve, bandage. General: butter, milk combined with lime water. If tuberculosis is present, treat.

Band like opacities with deposits of lime: Curette. If painful, enucleate.

Lime opacities: Lavage with ammon. chlor. and acid. tartar., iontophoresis with ammon. lact. (see medical therapy).

Keratoconus: Improve sight with glasses—cylinders, hyperbolic, contact. Hydrodiascope of Lohnstein. Organotherapy. Operation (cauterization of the apex.). Hot air douches.

Maculae corneae: Massage with yellow or grey ointment, with or without the addition of dionin (2 to 3 per cent), cadmium, tinct. opii croc., diluted 1:10. Hot compresses, hot vapor. Injections of fibrolysin or a 3 per cent sol. of pepsin hydrochlor. into the spots have been recommended. The latter is hardly advisable. In dense opacities, jequirity. Tattoo disfiguring scars.

Tumors at the limbus (sarcoma, carcinoma); raying, operation.

5. Sclera

Scleritis and *Episcleritis:* Treat cause: gout, rheumatism, syphilis, tuberculosis, arteriosclerosis, diabetes (aspirin, salvarsan, iodine, tuberculin, atophan, diet). Locally: massage, heat, 3 to 4 per cent dionin. Subconjunctivally: salt sol., hetol., asterol-dionin, iodipin. Scarification of the foci, carbonic acid snow, galvanization and faradization. Dionin for the pain. Diathermia, especially in gout. Iontophoresis.

Episcleral tumors: See cornea.

6. Iris and Corpus Ciliare

Causes: Lues, gonorrhea, tuberculosis, rheumatism, gout, diabetes, acute infectious diseases, dental disease. Secondary to corneal disease.

Treat cause. Protein body therapy has often had wonderful effect on the pain and progress of the disease. No alcohol or coffee. Regulate the diet and bowels, especially in gout and diabetes. Radium and radium emanations. Atophan in gout. Rest in bed. Baths. Radium in Koster's so-called cyclitis myopia.

Locally: atropine, scopolamine, sometimes combined with cocaine or dionin for energetic action. Both may be used in the form of salves. Watch the ocular tension. Paracentesis. Local light and ray treatment, especially in tuberculosis. Diathermia is said to be especially valuable in gouty forms. Galvanization or faradization for the pain, for which instillations of dionin are also efficacious. For vitreal opacities and nonirritative forms, and in depositis on Descemet's membrane, subconjunctival injections of salt, asterol or hetol. Injection of air is recommended in tuberculous forms. Iridectomy in adhesions (secondary glaucoma).

Tumors: Cysts: Incise, x-rays or radium afterwards.

Iridectomy in *benign* tumors; raying or enucleation in *malignant* (sarcoma, carcinoma). For the pain, locally dionin, acoin oil. Otherwise, analgesics.

7. Choroid

Choroid. disseminata: Search for cause (see iris). Corresponding therapy: iodides, salvarsan, tuberculin, sweats and baths. Locally: subconjunctival injections of salt sol., asterol (recommended especially by Senn in central choroidoretinitis), with or without dionin, oxycyan. mercury, hetol (especially in tuberculosis) dionin, iodipin. Irritative therapy. As a last resort, removal of vitreous and the paracentesis cure (q. v.).

Choroid. suppur.: After acute infections, sepsis, osteomyelitis, meningitis, infectious diseases or exogenous infections: Irritative therapy, collargol or other colloid silver preparations injected intravenously. Locally, atropine, dionin, hot compresses, subconjunctival injections. Exenteration. May try removal of vitreous.

8. Corpus Vitreum

Mouches volantes: Reassure the patient.

Opacities, caused by iridocyclitis or choroidoretinitis, hemorrhages, arteriosclerosis, lues, tuberculosis, trauma, senile or myopic degenerative changes: corresponding general treatment; sweats; iodine; salt sol., iodipin, dionin, gelatine, subconjunctivally. Removal of vitreous according to zur Nedden. Raying. Baths.

9. Lens

In the beginning, iodine internally, or as ¼ per cent eye drops in a weak solution of dionin for eight days, then one drop of 2 to 3 per cent dionin, which treatment must be continued for months; eye baths with 2 per cent kal. iod. sol.; also kal. iodide subjunctivally, three times a week,

lately has been combined with lens extract. Senn recommends asterol-dionin subconjunctivally (see local medical therapy). The value of these treatments has been disputed, and the lentocalin therapy has been completely given up. Some authors claim good results from iodosolvin or iodovasogen rubbed into the temples. Radium and secacornin have been tried (q. v.). In central opacity, dilatation of the pupil often improves the sight. Operation.

10. Glaucoma

Glaucoma acutum: Pilocarpin or eserin, alone or in combination. Avoid excitement, no alcohol or tobacco. Regulate the diet and bowels. Operation. To lower the tension, intravenous injections of hypertonic salt sol., thyroid preparations. Vistosan is said to cause decrease in tension and amelioration of the pain in acute glaucoma. In *hemorrhagic* glaucoma, raying and stypticin internally have been recommended.

Glaucoma chron.: Locally, the same therapy or arecolin. Iodine internally. Operation as soon as possible. Pressure massage, which should be done after operation, also.

Glaucoma absol.: For pain, dionin subconjunctivally, ray therapy. Injection of alcohol deep into the orbit. Exenteration.

11. Retina

Vessel changes and hemorrhages: Treat cause: nephritis, diabetes, arteriosclerosis, tuberculosis, lues, anemia, leucemia, malaria occasionally, purp. hemorrh., sepsis, trauma. In addition to general treatment, irritative therapy. Injections of milk recommended especially in nephritis. Stypticin in hemorrhages, action very uncertain. Rest, protect eyes, protective glasses. Subconjunctival injections of salt, hetol, asterol, the latter especially in degenerative and senile changes in the mascula (Senn). In periphlebitis, ray and tuberculin therapies.

Embolism cent. arter.: Manual or electric massage, paracentesis of the anterior chamber. Sometimes tuberculosis therapy may be indicated.

Thrombosis cent. vein: General treatment. Irritative therapy. Subconjunctivally, salt solutions. Paracentesis cure.

Retinitis pigment.: Treatment practically useless. Try sweats with pilocarpin; Hg. and salvarsan cures. Cod liver oil, cooked liver for the hemeralopia, salt sol. subconjunctivally.

Amotio retinae: Sweats and pressure bandage, gelatin subconjunct. Puncture followed by pressure bandage; 10 to 20 per cent salt sol. subconjunctivally, with preceding or subsequent puncture of the sclera, also galvanocautery of the latter instead of the puncture. Suction of the exudate with a syringe, and injection of it pure or dilute into the vitreous. Double perforation according to Deutschmann, possibly combined with vitreous transplantation. Stargardt's operation. Diet poor in salt.

Cysticercus: Injection of sublimate, 1:1000 into the vesicle, which is followed by its death. Operation.

Tumors: Glioma, enucleation as soon as possible; in bilateral affection, try raying.

Tuberculosis: General treatment.

Metastatic carcinoma: Try raying, so far hopeless.

12. Optic Nerve

Neuritis optica: Causes: lues, multiple sclerosis, meningitis, infectious diseases, disease of the nasal sinuses or orbit, nephritis, chlorosis, hemorrhages. General treatment, sweats, mercury rubs, iodine, galvanization, irritative therapy. In hemorrhages, infusion of salt sol. Examination of sinuses with x-rays.

Choked disc: Chiefly tumor, but also in nephritis, lues, tuberculosis, brain abscess, hydrocephalus, tower skull, sinus thrombosis, meningitis, multiple sclerosis, cysticer-

cus, rarely hypophysis tumors, anemia and chlorosis, also hemorrhage into the sheath of the nerve in trauma. Unilateral in disease of the orbit (tumor, abscess of the sinuses, fracture of the base of the skull).

In tumors and fear for vision, palliative trephining or incision of the commissure. Lumbar puncture not advisable in such cases. Resection of the nerve sheath according to Müller. In other cases, general treatment, irritative therapy, x-rays.

Neuritis retrobulb.: Cause very often multiple sclerosis, also lues, disease of the nasal sinuses. Alcohol, nicotin, sometimes carbon bisulphide, lead and methyl alcohol. X-rays of the skull and examination of the sinuses. Treatment of the cause: iodine, sweats, opening of sinus, Hg. and salvarsan, arsenic internally, injections of strychnine into the temples. Light baths to the head, and painting the nose with cocaine-adrenalin, especially when the sinuses are involved. Irritative therapy and diathermia.

Atroph. nerv. optic: In so-called genuine, i. e., those cases where we have been unable to find a cause, iodine, arsenic, salvarsan, Hg. with care. In disease of the hypophysis, try organotherapy or iodine and raying. Operation.

Where there is a complication with tabes or paralysis, a careful Hg. cure has recently been recommended, but the views as to its benefit are contradictory. Iodine, strychnine and spermin have hardly any effect. The cessation of the process has been observed after endolumbar use of salvarsan. We may try irritative therapy (infection with malaria). Diathermia.

In hemianopsia, try Igersheimer's hemianopic glasses.

Amblyopia and Amaurosis: Poisoning by alcohol, nicotine, carbon bisulphide, lead and methyl alcohol. Treat cause, irritative therapy, strychnine internally or subcutaneously. In amaurosis following hemorrhage, infusion with a salt solution.

Tumors: Operation. Sometimes may try raying.

13. Orbit

Exophthalmus accompanying Abscess or Phlegmon: Incise and drain (incise at the upper margin of the orbit, blunt dissection). In tuberculosis, disease of the bony wall or of the nasal sinuses, appropriate surgical treatment. Where a gumma is possibly the cause, Hg., salvarsan, iodine. It may be necessary to do a Kroenlein.

Exophthalmus accompanying Tumors: In dermoids, angioma, sarcoma, carcinoma, lacrimal glands, leucemia, tuberculosis, appropriate treatment. Knapp's or Kroenlein's operation. Examine for encephalocele. In injuries, remember tetanus.

Pulsating Exophthalmus after Trauma: Injection of gelatin, electrolysis, compress carotid, operation.

Periodic Exophthalmus: Present in several conditions of the orbit. Operation.

Exophthalmic Goitre: See serum- and organotherapy, baths.

Exophthalmus in Barlow's disease: See diet.

Enophthalmus following wounds: No treatment.

14. Traumata

Foreign Bodies: Cornea and Conjunctiva: Remove after cocainization. When they lie on the conjunctiva, look for erosion of cornea.

Iris: Operation.

Lens: Operation.

When the foreign bodies lie in the *posterior part* of the eyeball, their presence may be shown by the sideroscope, x-ray, or large magnet. When they remain a long time, iron produces siderosis, and copper chalcosis and copper cataract. Operation.

Incised and Punctured wounds: Determine whether or not they perforate (in perforating, decrease in tension can often be demonstrated).

Nonperforating: Cornea and sclera. If painful, orthoform salve, bandage, atropine if necessary. Always pay attention to the lacrimal sac.

Perforating: Cornea; bandage, reposition or excision of the prolapsed tissue, cover with conjunctiva after Kuhnt's method; suture.

Sclera: Suture, cover with conjunctiva, rest in bed. Examine lacrimal sac. Where there is danger of infection, cauterize lips of wound. When pneumococci are suspected, use pneu. serum; when infection is present, irritative therapy. Mercury cure, salicylic preparations, salvarsan. Locally, alcohol dressing; salt, Hg. oxycan., dionin injections. Exenteration.

In chronic cases, there is danger of sympathetic ophthalmia. If the eye is blind and painful, or if this has developed and the original eye is blind, enucleate. If it has even a little sight, however, treat the sympathetic ophthalmia, Hg. cure, salvarsan, irritative therapy (collargol, dispargen intravenously, 10 c.c., two times a week), and tuberculin. In addition, mercury and salicylates in large doses, also atophan. Benzosalin has been highly recommended in doses up to 10 g. daily. Locally: atropine, dionin, pyoktanin, instilled q. 2. h. For the pain, morphine subcutaneously. Raying.

Traumata without Penetration of the Membranes: Sew wounds if necessary; dermatol; xeroform, noviform salves; bandage. Mastix dressing for small wounds. Bandage for the swelling and edema. Cool compresses for hemorrhages.

In contusions of the cornea and superficial traumata, bandage and atropine if necessary. Watch the lacrimal sac, for danger of serpent ulcer. For hemorrhages in the anterior chamber or vitreous, bandage, rest in bed; sweats for old opacities of the vitreous, or iodine or subconjunctival injections, also raying. Suction according to zur Nedden's method.

Dislocation of the Lens: Danger of secondary glau-

coma; eserin, cyclodialysis or other antiglaucomatous treatment. Extraction of lens.

Retinal or Choroidal Hemorrhage: Resorbants, subconjunctival injections, irritative therapy, rest, protection of eyes.

Contusions with Penetration of Membranes: Suture if necessary. Bandage, rest, abscission of prolapsed tissue. If danger of infection, see above. In subconjunctival dislocation of lens, danger of sympathetic ophthalmia later.

Burns and Cauterizations:

Lids: Salves (bismuth, airol, etc.).

Conjunctiva and Cornea: Acoin oil, aristol oil, orthoform salve, bandage where necessary. Protection from symblepharon (transplantation of mucous membrane).

Acid burns: Flush with diluted solution of soda, 1 per cent bicarb. sodium, milk, solution of sugar. *Lye burns:* Dilute vinegar. *Lime burns:* Careful removal of all rests with water; baths with 10 per cent ammon. tartar. solution, or 2 per cent picric acid sol. In threatened symblepharon, see above. Treatment of old lime deposits, see cornea.

15. Ocular Muscles

Strabismus converg.: Glasses, after paralysis of accommodation with atropine if necessary. Exercise of weak muscle. Atropinization of the nondeviating eye. Mechanical and stereoscopic exercises. Operation.

Strabis. diverg.: Try mechanical exercises. Operation.

Paralysis: Seek the cause: lues, tabes, general paresis, sometimes multiple sclerosis, arteriosclerosis, lead poisoning, diabetes, brain tumor, poliencephalitis hemorrh., fracture of the skull, hypophyseal disease, disease of the orbit or frontal sinus. Congenital paralysis from fibrous bands. Iodine, Hg., salvarsan, galvanization, mechanical exercise, eye patch before diseased eye to prevent diplopia. Prisms, glasses. Operation if the condition has been stationary for a long time.

Nystagmus; congenital; correction of any refractive error.

Acquired; Miners'; morphine, change of occupation.

Paralysis of accommodation: Causes: lues, general paresis, diphtheria, botulism. The latter are always bilateral, otherwise usually unilateral. Specific therapy in lues or tuberculosis, otherwise expectant. Look for atropine paralysis. Electricity has been recommended.

Asthenopic conditions: Found in insufficiency of the interni and latent upward strabismus. When prescribing glasses, these must be looked for, and corresponding correction made with prisms. Operation if necessary.

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